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BRITISH SERPENTS



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Thamnophis natans,
or
RING SNAKE.

Crotalina viridis,

VIPERA RIBES,

or
ADDER.

THE LIFE-HISTORY
OF
BRITISH SERPENTS

AND THEIR LOCAL DISTRIBUTION
IN THE BRITISH ISLES

BY

GERALD R. LEIGHTON

M.D. EDINBURGH UNIVERSITY: THESIS, 1901, 'THE REPTILIA
OF THE MONNOW VALLEY'
FELL. SOC. SCIENCE, LETTERS, AND ART, LONDON

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TO THE

FIELD NATURALISTS OF THE BRITISH ISLES

IN GRATEFUL RECOGNITION OF

THE HELP SO WILLINGLY GIVEN BY MANY OF THEM

IN THE PREPARATION OF

THIS BOOK.

P R E F A C E.

I TRUST no apology will be considered necessary for this attempt to sketch the life-history and distribution of British Serpents somewhat more fully than has yet been done in any one volume. I should certainly not have ventured to publish a book on so limited a subject were it not that for the last few years I have been honoured with the correspondence of a very large number of field-naturalists in all parts of the country, who sought information on one or other point of this much-neglected branch of British fauna. That correspondence has been a source of very great pleasure to me, and I trust it will not cease on account of my effort in these pages to answer most of the queries raised. Rather I hope that those already interested may be induced to inquire more carefully into the habits of this most fascinating group.

I have divided the book into two parts. Part I. deals with the three species in turn, with some additional chapters on special points connected with them. Part II. consists of the result of my endeavour to ascertain the average length and relative frequency of the various species in all the counties. This inquiry has involved an immense correspondence, and I cannot sufficiently express my gratitude to those who have assisted in it. Every effort has been made to verify the reports, and I have no reason to doubt their accuracy: at the same time, of course, each observer is responsible for his own statements.

The source of these local observations is acknowledged at the end of each report, and I have given the addresses of the various writers in the hope that they may thus be encouraged to communicate with each other, having found from experience that the great difficulty in getting local information is knowing where to apply for it. I am very grateful to all these correspondents for the trouble they have taken in sending me their own notes, or in getting the information from others for me. Without their cordial help my effort to compare our Ophidia in various localities must necessarily have been barren of results. Many of these observers have written books, or contributed papers on their county fauna, and

from these I have quoted, with the permission of the respective authors. There is a very large amount of valuable material locked up in the Transactions of Field Clubs and local Naturalist Societies which observers in other parts never have the opportunity of seeing. For example, I have quoted largely from Mr C. A. Witchell's '*Reptilia and Batrachia of Gloucestershire*'; Mr Bryan Hook's papers in '*The Surrey Magazine*' on "*Surrey Reptiles*"; Rev. O. Pickard Cambridge's most valuable paper on the "*Reptiles of Dorset*,"—all of whom kindly sent me their observations. Of larger works on local fauna I am especially indebted to Rev. H. A. Macpherson, author of '*Fauna of Lakeland*', and his publisher, Mr David Douglas, for placing at my disposal the illustration of the curious variety of adder, first published in that work; and to Mr H. E. Forrest, author of '*Fauna of Shropshire*', for much information.

In addition to the above I have to thank the editors of the following publications for permission to make use of their columns for purposes of reference and quotation: The '*Zoologist*', '*Science Gossip*', '*Annals of Scottish Natural History*', the '*Field*', '*Country Life*', the '*Outlook*', '*Morning Leader*', '*Western Mail*', '*Newcastle Weekly Chronicle*', '*Cardiff Express*', and '*Scotsman*'.

My cordial thanks are offered, too, to Sir Robert Hodson and Dr Thompson for supplying me with the actual facts in connection with the occurrence of ring snakes in Ireland; and to Mr Thomas and Mr Lewis for so kindly sending me information and specimens regarding the Plague of Snakes at Llanelly. I am also indebted to G. A. Boulenger, F.R.S., F.Z.S., for the measurements of adders in the British Museum, and other kind assistance. The fatal case of adder-bite I have quoted from the 'British Medical Journal,' by permission of the editor; and the observer, Dr P. P. Jennings.

With regard to the illustrations in this book, all are from my own photographs with the exception of the portrait of "Brusher Mills," which is supplied by Mr Short of Lyndhurst; the photo of the blunt-tailed ring-snake, which is by Mr Forrest, and that of the adder from Rev. H. A. Macpherson's book, previously acknowledged. I owe a special debt of gratitude, however, to Rev. O. Pickard Cambridge for lending me specimens of the smooth snake to photograph. Snakes are not the easiest of objects to photograph, and I trust my illustrations will be judged, not from the point of view of artistic pictures, but as indicating the special point aimed at in each.

Most of these photos are now published for the

first time. One of the adder's gullet illustrated a paper in the 'Zoologist' (September 1900) by myself; and seven were published in 'Good Words' (January 1901) to illustrate an article by F. G. Aflalo; while two (those of a young ring snake and a bundle of eggs) appeared in 'Country Life.' The editors of these three publications have kindly permitted their reproduction here.

I have to thank my brother-in-law, Mr George Gordon, for the trouble he has taken in verifying some records and for other help; and my friend, Rev. M. G. Watkins, for valuable aid.

Lastly, I cannot say how much I have been encouraged in my work by the interest taken in it by my former teacher, Professor Cossar Ewart, of Edinburgh University; and by the aid and advice of my friend, F. G. Aflalo, F.R.G.S., F.Z.S., the latter of whose various books on animals have furnished me with many quotations, and whose valued friendship I owe to a common interest in the animals of this country.

GERALD LEIGHTON.

GROSMONT, PONTRILAS,
HEREFORDSHIRE, *July* 1901.

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PART I.

CHAPTER I.

THE CLASS REPTILIA.

RELATIVE DISTRIBUTION OF REPTILES — IRELAND — NEW ZEALAND — RELATION TO AMPHIBIANS AND BIRDS — EXISTING ORDERS OF REPTILES — BRITISH SPECIES — DIFFICULTY OF OBSERVATION — CLASSIFICATION AND TERMINOLOGY USED IN BOOK.

In very few countries of the world are the members of the class REPTILIA so sparsely represented as in the British Isles, and in all probability there are few persons who regret that fact. The charm of a ramble through solitary English woods, or over the more rugged mountains of Scotland and Wales, is not materially lessened by the dread of encountering venomous serpents, as is the case in so many countries which are otherwise delightful. What a striking contrast, for example, to the continent of America, where "out of some three thousand species of living reptiles known, three hundred and forty-eight are North American"; while "there are one hundred and thirty species of snakes in America

north of Mexico!"¹ In Australia, too, there are large numbers of serpents: "first, the harmless, of which there are some five-and-thirty; secondly, the



1.



2.



3.

FIG. 1.—HEADS OF THE THREE BRITISH SERPENTS.

1. The Adder. 2. The Ring Snake. 3. The Smooth Snake.

venomous, over seventy, including the sea-snakes."² Compared with such countries as these, our British serpents do not form a very imposing list, three species only being found, only one of them at all

¹ Packard.

² Aflalo, *Natural History (Vertebrates) of the British Islands*.

venomous. Even these three are confined to England, Scotland, and Wales, there being no representative of the serpent tribe indigenous to Ireland—another grievance from the naturalist's point of view, perhaps! St Patrick's decree of banishment has long been popularly associated with this curious local immunity, while others have suggested that the fact points to Ireland having been cut off from the continent of Europe before the serpent species had reached so far west. Whatever the real explanation may be, the fact remains that (with the exception of some isolated occurrences referred to later) Ireland has no serpents. Lizards are the only reptiles found there.

New Zealand, too, has no serpents except venomous sea-snakes, though here again the order of lizards is represented; and there are other oceanic islands which exhibit a similar peculiarity.

Climate has, of course, a great deal to do with the distribution of reptiles, as they are essentially inhabitants of warm and temperate lands, becoming rarer the farther north one goes. Thus, "In Europe snakes cease at 60° north latitude, and at 6000 feet elevation in the Alps";¹ the lizards, however, extend both to the more northern latitudes and to higher elevations, except in North America, where the serpents are found more northerly than the lizards.

To the naturalist who studies the development of

¹ Packard.

animal types, the class Reptilia is one of absorbing interest. Standing, as it does, next to the amphibians on the one side and to the birds on the other, the reptiles show a distinct relationship to both; so that there is found in them a further development of a type of structure first seen in the amphibians, and at the same time indications of features which appear in greater perfection in the birds. So much so, indeed, is this the case that reptiles and birds have been classed together as a single series of animals under the one name *Sauropsida*. Thus we see that "no one class of vertebrates stands alone by itself. Every year fresh researches by palæontologists and the re-examination of living vertebrates, especially in their embryonic history, prove that no single class, not even a type so well circumscribed as the modern birds, is without links, forming genetic bonds, allying them all together. The different classes of vertebrates, as well as of other branches of the animal kingdom, form an ascending series."¹

In the class Reptilia we find some members which are equally at home in water or on land, or which spend part of their time in one element and another part on the other. Our own common ring snake, though a capital swimmer and fond of water, is mainly a land serpent; while our adder, as a rule, is averse to water, and is but rarely found at all in damp places.

¹ Packard.

The only existing forms of the class Reptilia—there are six extinct orders—are the following :—

- Order 1. CHELONIA (tortoises and turtles).
- " 2. LACERTILIA (lizards).
- " 3. OPHIDIA (serpents).
- " 4. CROCODILIA (alligators and crocodiles).

The curious New Zealand lizard is by some authorities given an order to itself, but we need not concern ourselves with that point. As we have already said, our British reptiles are confined to the orders of serpents and lizards, and there are three representatives of each of these orders.

These are as follows :—

Order LACERTILIA or LIZARDS :

- 1. *Lacerta vivipara*, common lizard.
- 2. *Lacerta agilis*, sand-lizard.
- 3. *Anguis fragilis*, slow-worm.

Order OPHIDIA or SERPENTS :

- 1. *Vipera berus*, the adder.
- 2. *Tropidonotus natrix*, ring snake.
- 3. *Coronella austriaca*, smooth snake.

The lizards do not come into the scope of this work, except in so far as their presence or absence affects the snakes, a point to be dealt with later on. They have been studied with great accuracy and detail by various observers, and have a literature of their own.

Our harmless ring snake, too, has had a good deal of attention paid to it; but our only venomous serpent, the adder, seems to have been much neglected, at any rate as far as the study of its habits in a state of nature is concerned. It is not difficult to see why this should have been the case. In the first place, many people have a great horror of venomous serpents, even people who are keenly interested in most other animals. Secondly, the observation of adders in their natural haunts is beset with difficulties greater than any which apply to the study of many other branches of our fauna. Adders are not to be found in every field, nor just when one has the time to give to their observation. They are unobtrusive creatures, and always keep out of sight if possible, and they are, of course, most undesirable pets. For all these reasons it is most difficult to gain anything like an adequate idea of the natural life of our adders. Indeed there are few subjects requiring so much patience and perseverance as an investigation such as this. But since the adder is the member of the group whose life-history has been least worked out, I have given most of my attention to it, and hence this species will be found to occupy what might otherwise appear to be an unduly prominent position in these pages. There are many curious ideas about adders prevalent in some districts, and still more queries concerning them awaiting solution. They have been credited with some very startling performances, the evidence for and

against which we shall have to carefully consider and examine; and without giving them credit for possessing any supernatural powers, we shall find, I hope, that they present a most interesting study.

Before beginning to describe various species of our serpents, it will be well to have a very clear understanding as to the terminology employed. We have already classified the species above, and also enumerated them. Let us consider now for a moment their ordinary everyday names.

Our venomous serpent is sometimes spoken of and written about as "the adder," and as often, perhaps, as the "viper." These are synonymous terms, both correct, and both referring to *Vipera berus*. But in some books, especially the older writings, the Latin name of *Vipera communis* is used, or again *Vipera verus* may be found. These also, then, are synonyms. In order to avoid any confusion we shall always use the term *Vipera berus* for the adder. It is convenient to restrict the use of the term "viper" to the small red variety of the species. This reptile is not at present regarded as a distinct species, though, I confess, it seems to me that it might well be so. The scientific name of our harmless common British snake is *Tropidonotus natrix* (the Latin *natrix* meaning a water snake). In English we hear and see this species spoken and written of as the ring snake or as the grass snake, the former term having reference to the peculiar marking, the latter to the habit, of the reptile.

This snake has many other names given to it, of more or less local application. These terms are again synonymous, and equally correct; but for the sake of uniformity, and also because it is more descriptive, we shall always refer to *Tropidonotus natrix* as the "ring snake" when using the English name.

With regard to our third British species, the rare "smooth snake," the name *Coronella lævis* is perhaps most usually adopted. But it is more correct to describe this serpent as *Coronella austriaca*, and hence this term will be used.

To sum up, then, our terminology—

Vipera berus means the adder.

. *Tropidonotus natrix* means the ring snake.

Coronella austriaca means the smooth snake.

The small variety of our venomous serpent we shall refer to as the "small red viper."

We shall often have occasion to refer to *Anguis fragilis*, and this lizard we shall call the "slow-worm," not the "blind-worm," because it is not blind, though it is somewhat slow to get out of one's way; but its movements cannot by any means always be described as "slow."

Lastly in this connection, let us be careful not to use the term "snake" as opposed to "adder," as some do. This is most unscientific and wrong. All the Ophidia are "snakes," which is only another name for "serpents."

CHAPTER II.

TROPIDONOTUS NATRIX, OR THE RING SNAKE.

DISTRIBUTION — DESCRIPTION — SIZE — MARKINGS — HAUNTS —
FOOD — REPRODUCTION — ANATOMY — FREQUENCY — SYNONYMS
AND CLASSIFICATION.

Distribution.—The ring snake is by far the most numerous of the British serpents; but while this is so it by no means follows that its distribution is uniform throughout the country, and indeed this is far from being actually the case. Its detailed distribution is considered under the head of "County Distribution" later, but it may be noted here that this species is practically absent from Scotland, occurring only in one or two of the south-eastern counties, and there but rarely. In the north of England, too, it is scarce, the Cumbrian mountains apparently offering an obstruction to its progress on the north-west.

The ring snake is seen in greatest abundance in Wiltshire, Gloucestershire, and in some of the Welsh counties; but it has a universal distribution throughout the south of England, except in some restricted

districts where the local conditions are altogether in favour of the adder. Such a locality is the valley of the Monnow, on the South Herefordshire border. For a distance of eight miles in this valley I have seen only one ring snake in five years, during all of which time I have been snake-hunting there in the summer

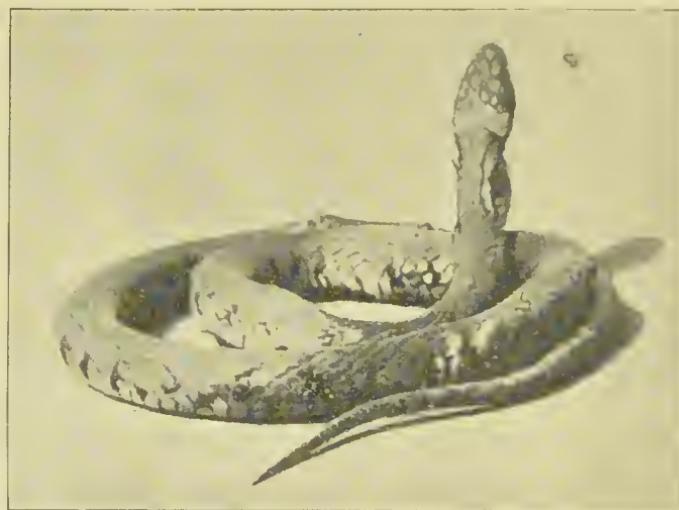


FIG. 2.—*TROPIDONOTUS NATRIX*, or RING SNAKE (24½ inches).

Note—

Plates on head.

Yellow collar.

Dark rim behind collar.

Markings on sides of body.

Tail tapering to fine point.

Scales (ventral and dorsal).

months. This single specimen has supplied my illustration of this species, and was caught by one of the keepers at Kentchurch Court on September 26, 1898. I happened to drive up just as he caught it, and the keeper told me that he saw the snake crossing the drive, coming from the yard to a stream which runs

just by the drive on the opposite side. It was a most beautifully marked specimen, and I have it now in my collection, sole representative of its species as far as this valley is concerned. No doubt it had been brought to the Court in a load of something, as I am quite satisfied that these ring snakes do not breed in this locality. If they did they would be far more common. A more extreme instance of the same kind of thing is reported from Ireland in 'Country Life' (November 3, 1900), to which reference will be made later on.

This reptile is by far the most common snake in Europe, being found in almost every country—in varying numbers, of course, according to the climate. Thus it does not occur in the most northerly portions of Russia ; while it is present in the island of Sicily.

Description.—Nothing to my mind is more difficult than to describe colours and shades, especially those of animals. The personal conceptions of individuals are so different in the matter of colours. Still the attempt must be made; but a careful inspection of a specimen will convey more than any amount of printed description. What strikes the observer at once on looking at a ring snake is the brilliant yellow or orange collar, divided in the middle line on the back of the neck by a narrow dark line. Immediately behind this collar is an incomplete dark - brown or black patch, the incomplete part being on the ventral surface. This dark band is much wider on the sides

of the neck than on the back of the snake. Behind this again the general body colour is olive-green, darker above than below, shading off into a light greenish-yellow on the sides of the body, the ventral surface (that which is in contact with the ground when the snake is in motion) being dark bluish-black. Along the sides of the long attenuated body are two rows of irregularly shaped black patches, one row on either side of the body. Above these on the back are two parallel rows of smaller black spots. The young are darker all over when first born, but they soon show all the brilliant hues of their elders, the yellow collar becoming very bright in a few weeks. In a specimen about two months old it is noticeable that the two largest head-plates (the posterior ones, that is) are of a distinctly darker colour than the anterior ones.

Size.—The ring snake grows to a far greater length than does either the adder or the smooth snake, varying in different localities. The average length of the adult may be said to be from 30 to 36 inches (though when a snake becomes an adult precisely is very difficult to say). Much larger ones, however, have been recorded. F. G. Aflalo mentions that Lord Londesborough had one measuring 5 feet 8 inches, from the New Forest. Such a length is of course most exceptional, and it is very rarely that specimens of 5 feet are taken. I once got one of 40 inches in North Monmouthshire, near Abergavenny, the



FIG. 3.—RING SNAKE ($3\frac{1}{2}$ feet, Cornwall).

largest I have seen in that district, where they are not uncommon. (See later for county records.)

Shape.—In proportion to its length the ring snake is much thinner or more attenuated than the adder, especially towards the tail. This, indeed, is often quoted as a mark of distinction between the two.

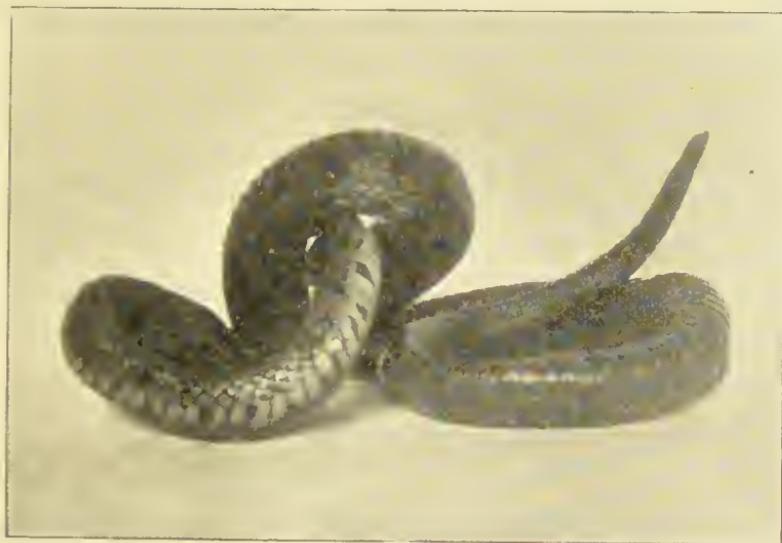


FIG. 4.—RING SNAKE WITH BLUNT TAIL.

(Photo by H. E. Forrest; specimen in Shrewsbury Museum.)

The tail of the former tapers off to a very fine point, while that of the adder is somewhat blunt. Though the ordinary rule, this is not invariably the case, as may be seen by a specimen in the museum at Shrewsbury, which Mr Forrest was good enough to draw my attention to, in which the tail of the ring snake is almost as blunt as the tail of an adder.

If, however, the sub-caudal scales be counted in these blunt-tailed ring snakes; it will be found that the snakes have been at some previous time deprived of part of the tail by some accident. Thus, in the specimen figured and just mentioned, the scales under the tail numbered thirty-six pairs instead of the sixty-five or more in the normal tail. The end of the tail assumes the spine-like character it had originally, but the tail does not grow again to the former length.

Haunts.—It may be taken for granted that ring snakes never make their headquarters far from water. Damp marshy districts they delight in, hot arid slopes they avoid—exactly contrary to the taste of the adder. This explains in great part their distribution in these isles. Perhaps the most favourite haunt of the ring snake (if available) is a quarry or other pit in the neighbourhood of a pond or river. In such a place he (or she) can indulge in the luxury of the morning swim in the sunshine, and retire from observation or for the winter's sleep. The long rank grass, too, of the marshy land offers great temptations in the shape of food-supply: where the lizards and amphibians congregate, there also will the ring snake be found. On grassy banks, in undulating fields, it may be encountered, but always more abundantly in well-watered districts.

Food.—A good deal has yet to be learnt regarding the food-supply of our reptiles, especially in the period of their early youth. In fact, I do not know

whether any one could say what our snakes first feed on in their infancy ; at any rate, I would not presume to dogmatise about it. *Probably* some insects and small slugs are the first diet, but as the snake grows to maturity much bigger game is substituted. An adult ring snake undoubtedly prefers a young frog to anything else, and the process of swallowing it is a task requiring some time and careful manipulation. The frog is, as a rule, seized by one hind-leg, simply because it is usually making an effort to keep well ahead of the pursuing snake. It is a hopeless effort, however, and the reptile, darting forward its head with an extremely rapid movement, secures its prey, then proceeds more leisurely to devour it. Once caught, the frog makes no further struggle, exhibiting that remarkable state of semi-unconsciousness often seen in other animals in the presence of serpents. One hind-leg swallowed, the body of the frog begins to disappear, the mechanism of the ophidian jaw being adapted for the passage of very large articles of diet. The picture presented at this stage of the performance is sufficiently ludicrous,—“the three legs and the head of the frog are seen standing forward, in a very singular manner.”¹ If in the first place the frog happens to have been seized by the body, the snake turns its victim until the head is towards the mouth and then swallows the frog head first, the unfortunate amphibian being alive all the while.

¹ Knapp.

Indeed it often survives the journey into the stomach of the snake, and some have even been rescued from their perilous position here apparently little the worse for the unpleasant experience. But frogs are by no means the sole food of the ring snake. Toads, too (most deleterious of foods, and rejected, as Aflalo says, by almost every living creature), are devoured. Newts also (again deleterious food) are welcomed, being "often captured in the water, but invariably consumed on the bank."¹ Being an expert swimmer and very fond of passing part of its time in the water, it is not surprising to find that this snake obtains a considerable portion of its food in that element; hence it is said that the ring snake will dive after water-newts, and even catch fish. But the ring snake does not by any means restrict itself to a water-diet. One of its most favourite meals consists of mice (like the adder in this respect). Birds, too, and their eggs are another variety of food largely partaken of, especially the newly hatched young of birds which build their nests on the ground. It should be mentioned also that amongst the foods supplied by the rivers and streams water-voles are conspicuous, several of which have been found in the stomach of this snake at the same time (see adder-food later).²

¹ Aflalo, Natural History (Vertebrates) of the British Islands.

² It should be stated that some authorities deny that the ring snake feeds upon any animal higher in the vertebrate scale than amphibians—not birds or mammals.

It thus seems that the food of the ring snake is exactly what would be expected from an animal of its habits and anatomy.

Reproduction.—In its reproduction the ring snake is an oviparous animal—that is, an egg-producing animal. The female does not bring forth young ring snakes, but lays a number of eggs. What that precise number is on the average I do not care to say too definitely, considering the very various estimates given by different writers. Thus the following figures are given :—

M. C. Cooke gives the number as 16 to 20 eggs.

H. E. Forrest " " 20 or more eggs.

F. G. Aflalo " " 20 to 30 "

Miss C. Hopley " " 15 to 25 "

In his book of 'British Vertebrates' Aflalo, however, states that there may be as many as four dozen eggs deposited at a time, and this is undoubtedly true. A correspondent of mine who was investigating the plague of snakes at Llanelly for me (see chap. iii.), found forty bundles of eggs, the average number in each bundle being thirty eggs. These were all found at the same time and place, so give a good opportunity of forming an estimate on the point. It will probably be very near the correct figure to estimate the average number of eggs deposited by the ring snake in a season, though not necessarily at one time, at from twenty to thirty. Their size

varies according to the amount of moisture absorbed and to the time of development, but they are generally about an inch long when found, and the bulk of a pigeon's egg.

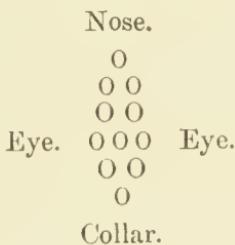
The eggs are laid in the late spring or early summer, and having selected the spot for their deposition, the female apparently cares no more about the future of her offspring. The spot selected more often than not takes the form of a heap of manure (which offers both warmth and moisture), or any convenient collection of rubbish. But bundles of the eggs may be found in all sorts of places—in fagots, in old walls, or any warm moist vegetable material. The separate eggs adhere together by means of a glutinous secretion deposited with them, and which causes them to adhere in strings even when the young have left the eggs, and the latter are quite dry and brittle. The covering of the embryo is not shell but a tough leathery membrane, through which moisture can penetrate. The period of development varies somewhat with the heat and moisture to which the eggs are exposed, but is generally about eight weeks after the eggs are extruded. This is not the whole length of the period of development, which has already reached a certain stage when the eggs are deposited. “The embryo at the time of hatching is provided with a temporary horny tooth on the snout, to cut through the eggshell.”¹

Anatomy.—Without going into any great detail

¹ Packard.

which would be beyond the scope of this work, and which can be studied in the larger text-books on Zoology, a few of the more general anatomical points of the ring snake may be noted. There are certain *negative* points which are characteristic of the order Ophidia. Thus there are no limbs, no external eyelids, no tear-ducts, no lips (only scales), no urinary bladder, no epiglottis at the back of the tongue, no sternum (the bone which the ribs join on to in some animals). In addition to these general negative qualities of the order the ring snake is also non-poisonous and non-Irish; so that a good deal may be learnt about this species by simply knowing what it is *not*.

There is a complete covering of scales. Those on the top of the head are characteristic of the species, so must be noticed particularly. They are in the form of large plates, and have a definite arrangement. This arrangement may be expressed diagrammatically thus (using the capital letter O to represent a single plate):—



This is the disposition of the largest plates, the relative positions of the nose, eyes, and the yellow collar being shown by the same words. There are other smaller

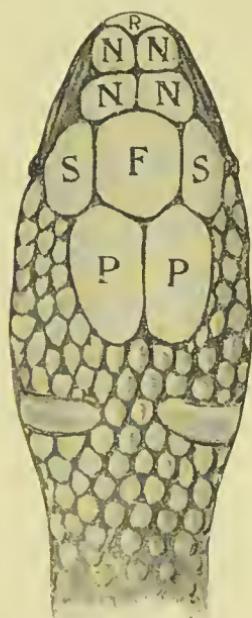
plates on either side of these large ones. Notice that the eyes are opposite the row of three plates, and that the largest of all are the two immediately behind these.

This is different from the arrangement in the adder, but cannot be said to be a very ready means of distinguishing the species until it has been captured. The scales on the back are keeled or carinated—that is, they are possessed of a mid-rib like a leaf. Hence the generic term of "*Tropidonotus*," which means literally "keel-backed." This keel is still more prominent in the adder. The scales along the ventral surface are in a single row as far as the anal orifice, when the row becomes a double one. The tail is about one-fourth the length of the whole reptile.

FIG. 5.—HEAD PLATES
OF RING SNAKE.

(N, nasal; F, frontal; S, supra-ocular; P, parietal.)

The teeth are in two rows on both the upper and lower jaws, and are recurved, pointing to the throat, so that it is difficult to extract anything from the mouth when the jaws have closed upon it. "They are not in sockets, and consequently are not used to tear or crush food."¹



¹ Packard.

The tongue is very long and forked, and is provided with a muscular sheath, by means of which it can be quickly protruded and withdrawn. The jawbones are very freely movable, allowing of the distension of the throat to the immense extent required to swallow the large articles of diet. On dissection the right lung only is found fully developed, the left being rudimentary. It is obviously more convenient for a long cylindrical animal such as a serpent to have one long tubular lung than two shorter and more bulky ones. This want of symmetry is to be seen in other internal organs, no doubt for a like reason. Thus the right ovary is larger than the left, and is not opposite but anterior to the left one. The windpipe is much elongated. The lack of true eyelids is supplied by the presence of a transparent scale, like a watch-glass, which is shed with the rest of the slough.

One prominent feature of the ring snake is its habit of emitting a powerful and unpleasant odour when disturbed. A correspondent of mine, who has killed some hundreds of ring snakes, assures me that he can always smell them directly he gets within a few yards of them. The odour is the product of two glands placed just within the anal orifice. So much for the structure of the most common of British serpents.

The only instance I have ever come across of a ring snake attacking an adder is furnished me by Mr Rees, who says: "One summer's morning at Newpark

(Glamorgan), when walking along a hedgerow, my attention was attracted by a hissing noise, and on looking into the ditch I saw an adder about 10 inches long, which had been half-swallowed from the tail forwards by a ring snake. The latter was about $3\frac{1}{2}$ feet long. The ring snake itself was dead, whether suffocated or poisoned I am unable to say. I killed the adder, and on examining the ring snake could see no marks of its having been bitten by its adversary."

A good deal more will be said about this snake in discussing the points of contrast and comparisons with the adder. But there is one matter which must strike the thoughtful student or reader in connection with this species, and it is this. Seeing that the average number of eggs deposited by each female is about thirty, how is it that these snakes are not found more frequently? For, after all, it comes as a surprise to meet one of them in a walking tour, not to say in an afternoon stroll. Squirrels and stoats, and many other varieties of animals not nearly so prolific as ring snakes, are encountered, but every one is astonished on meeting a serpent in most parts of England. No doubt the retiring and unobtrusive disposition of the reptile has a good deal to do with its being seen so infrequently, for it will always glide quickly and noiselessly away, if it can, when disturbed. Then, too, its protective colouring makes it difficult to see in the grass unless the observer is

quite close. But, granting all these considerations, one would still expect to disturb ring snakes more often than one does. There must be something more than these reasons to account for it; most likely the secret is in the accidental destruction of eggs,—accidental, that is, from the snake point of view. Manure-heaps are apt to be scattered over the ground and ploughed or dug in, and rubbish-heaps are apt to be the chosen spot for burning the garden refuse; neither of which processes would be conducive to the successful development of the embryo ring snakes. Other eggs are no doubt destroyed by different animals, possibly as food (why should not rats eat the eggs ?), and others again may be trodden upon or destroyed by pressure in different ways. Some such accidents as these must be partly responsible; and lastly, conditions of climate have to be taken into account. It frequently happens that the young are not hatched out in the autumn, but lie undeveloped till the following spring. During a very severe winter many eggs may quite conceivably be frozen beyond recovery, and so, in spite of the large number of eggs deposited, ring snakes are somewhat infrequently met with.

Ring snakes are interesting pets to keep in captivity, not savage, and even if they did bite, no harm would follow.

The following complete classification may assist in referring to scientific works, and the list of synonyms

may be useful in identifying museum specimens, and for other reference:—

Class	REPTILIA.
Order	OPHIDIA.
Sub-order	COLUBRINES.
Family	COLUBRIDÆ.
Species	<i>TROPIDONOTUS NATRIX.</i>

Also named—

<i>Natrix torquata.</i>	<i>Coluber torquatus.</i>
<i>Torquata natrix.</i>	<i>Tropidonotus persa.</i>
<i>Coluber natrix.</i>	<i>Coluber murorum.</i>
<i>Natrix vulgaris.</i>	

English names—

Ring snake, or ringed snake.	Grass snake.
Green snake.	Common snake.
Hedge snake.	Water snake.

All these terms will be found used to refer to the ring snake either by authors or as local names.

CHAPTER III.

THE RING SNAKE—*Continued.*

THE PLAGUE OF SNAKES AT LLANELLY.

NEWSPAPER REPORTS—FACTS OF CASE—DESCRIPTION OF LOCALITY—EXPLANATION OF OCCURRENCE.

THAT a dwelling-house in this country should be visited with a plague of serpents seems like a wild romance, and no doubt many people who read the following paragraph (or a similar one) in the daily papers of September 1900 mentally gave the reporters credit for somewhat lively imaginations:—

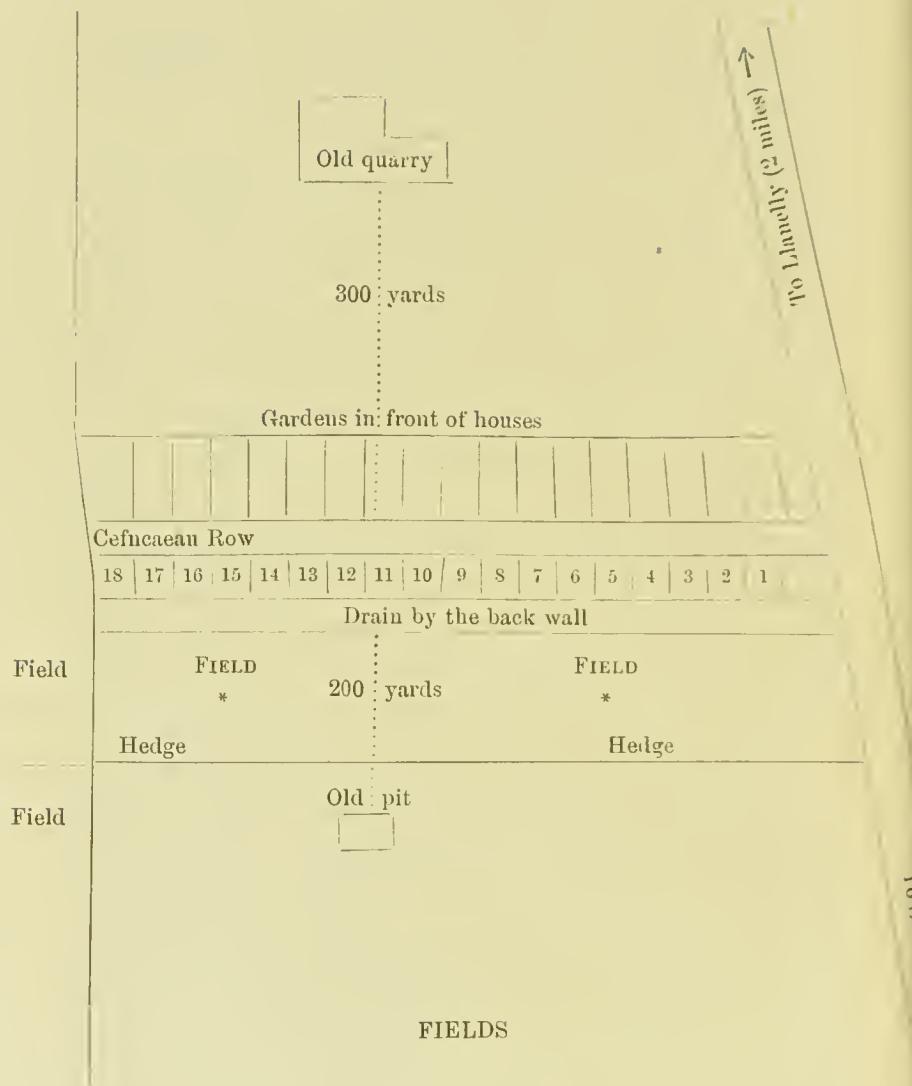
“The residents of a house at Cefncaeau, near Llanelly, are suffering from a plague of snakes. The reptiles are of all sizes and colours, and they crawl over the floors, infest the cupboards, and curl themselves up on the furniture, and even luxuriate in the bedrooms. No fewer than twenty-two snakes were slaughtered in one day.”—‘Morning Leader,’ September 1900.

The Cardiff ‘Western Mail’ gave still more details, and reported the occurrence thus:—

“The residents of a house at Cefncaeau, near Llanelly, have undergone a very unpleasant experience of late. It was reported by the sanitary inspector of the borough council on Friday that the place had become the domicile for innumerable snakes of all sizes and colours. They crawled over the floors, infested the cupboards, curled themselves together on the furniture, while some more aspiring members of the species climbed the stairs and luxuriated in the comforts of the bedrooms. The human occupants of the house had done their best to rid themselves of these unwelcome visitors, and had waged a war of extermination against them. The snakes continued to come, however, no fewer than twenty-two being slaughtered in one day, as the inspector explained. The sanitary committee listened to the recital of these facts with horror written on their faces, but took no action in the matter, being uncertain, probably, whether their jurisdiction extended to snakes. However, the inspector will probably serve notice to quit upon them, failing compliance with which, more summary measures will be taken.”

Most of the daily papers made some reference to the occurrence, the ‘Standard’ had a leading article on it, and the whole thing seemed so unique in the history of British snake-lore that I determined to investigate it. Accordingly I wrote to the sanitary inspector

asking him for the facts of the matter as they had come under his notice, and asking him if possible to send me one of the snakes for identification. He very kindly wrote me an account of what he knew, and at the same time put me into communication with one of the residents of the houses concerned, and to these two gentlemen I am indebted for the following details of the locality. It seems, then, that the house in question is situated in a row of eighteen, called Cefncaeau Row, some two miles from Llanelly. The row faces north, the road runs at the front doors, the gardens of the houses being across the road. Beyond the gardens is a field in which is an old quarry, called Cae Cefn quarry. The distance from the quarry to the front of the row is 300 yards. At the back of the row is a stubble-field, the level of which is above that of the ground-floor of the houses. There are no back-doors to the houses, the back walls of which are only separated from the field by an open drain, which carries off the water. Each house has a small back-window looking on to this field, some of these windows being made to open, others not. Each house consists of two rooms below and one long room above. In the second field at the back is an old disused coal-pit, now filled, and which has not been worked for a hundred years or so. This is 200 yards from the back wall. Fields bound the row at one end, the other end opening into the turnpike road which leads from Llanelly to Swansea. A glance at the plan appended will

*Plan of locality.*

From quarry to houses is 300 yards.
 From the old pit to houses is 200 yards.
 The ditch and drain run by the back wall.
 The large snakes were killed in the field*.

make all these details clear, and show that the approach to the row is open on three sides. The houses were built some sixty-eight years ago, and were in bad repair at the time. No. 2 was the house where the snakes appeared in such numbers. The woman who occupied it one day saw a small snake on the hearthstone right in front of the fire. The next day she saw *several dropping down from a small hole in the wall, about 2 feet from the ground-floor.* They then made a search and found a dozen more, and again in another place found several small ones. The tenant then complained that the place was unhealthy, and left, having first reported this extraordinary state of affairs. Some weeks later the sanitary inspector was looking over some repairs to this particular house. The back wall was taken down and also the oven, but nothing reptilian was seen, until on removing the *débris* the inspector saw a small snake and promptly secured it. This specimen was forwarded to me for identification.

Such are the facts as I first got them, and as there were several points which struck me as requiring a little further elucidation, I wrote to Mr Lewis, of No. 10 Cefncaeau Row, for further information. In reply to my questions Mr Lewis kindly gave me the following additional details concerning the snakes in the immediate neighbourhood.

In the next house to the one above referred to, a large specimen, 2 feet 3 inches long, had been killed

a short time before. The twenty-two killed in No. 2 were all young ones recently hatched, and did not measure more than eight inches in length. The hole from which they were observed to issue was in the back wall some 18 inches from the foundations, and led to the outside, there being no obstacle to the passage of the reptiles. When this old wall was being repaired shortly afterwards an astonishing condition of affairs was seen. No less than forty bundles of eggs were found, each bundle consisting of about thirty eggs, and out of every egg a young ring snake was on the point of issuing. These measured 6 inches long. Thus there were within the space of a few feet some 1200 young ring snakes.

Mr Lewis further informs me that for some years the snakes have been getting more numerous near the houses, and that scores have been killed every year for the last few years in the open drain at the back of the row. In the fields around, about fifty yards away, several have been killed as long as 4 feet, and many 3 feet.

The old coal-pit seems to have nothing to do with the snakes, as it has long been filled up and is not overgrown with brambles or other cover.

Last year (1899) some workmen were quarrying some stone for building purposes in the old quarry, and one day came across an immense number of snakes hibernating. They were of all sizes, from 7 inches to 4 feet. Mr Lewis says that he himself

killed hundreds of them. "They were of a light-brown colour, and had a bright yellow band round the neck." With this detailed information of the state of affairs it was not a matter of great difficulty to understand how the plague of snakes had come about.

There was no doubt that the obtruding reptiles must be ring snakes, their numbers proved that pretty conclusively, and the specimen sent me by Mr D. P.

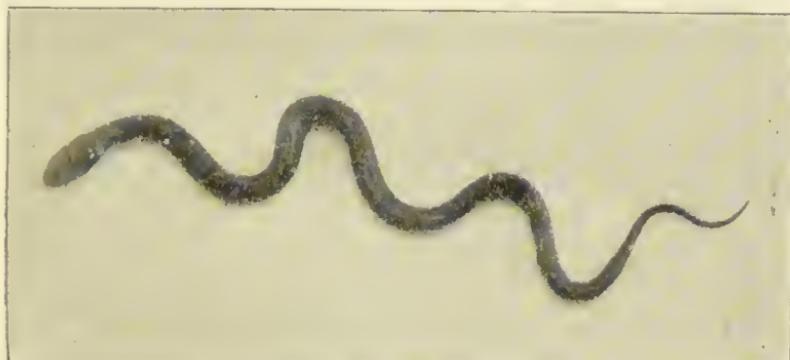


FIG. 6.—YOUNG RING SNAKE FOUND IN THE DÉBRIS OF THE WALL.

Thomas, sanitary inspector, settled the point. It was a young ring snake $7\frac{1}{4}$ inches long, with all the characteristic markings. It is shown in the illustration above. Mr Thomas also sent me a bunch of the eggs, or rather the egg-membranes, as the young had been hatched out of them, except in one or two, which contained the skeleton of the embryo.

The interesting problem which presented itself at first was, Where did all these snakes come from, and

how did they get into the house? But after I had got these full and careful reports from my correspondents there was not much of a problem then left to solve.

No doubt the headquarters of this colony of ring snakes is in the old quarry. From there they have



FIG. 7.—EGGS FOUND IN THE OLD WALL.

nothing to prevent them getting round to the back of the houses, and the wet ditch is the place they would naturally make for. Given a hole in the back wall of house No. 2, and the entrance is sufficiently obvious. From the fact that these twenty-two made their appearance all at once, I think that

the eggs had probably been deposited in the hollow wall, and the young developed there. The twenty-two that were killed at the same time were, moreover, all the same size, which also bears out this supposition.

According to the calculation of Mr Lewis, 1200 young ring snakes were despatched on the occasion of the pulling down of the back wall on October 27, 1900. It is almost a pity that the repairs were not deferred for another week or two, when the condition of things would have been a sight worth seeing. But I should expect that the dwellers in Cefncaeau Row have not seen the last of their unwelcome visitors, as no doubt there are more old ones in the quarry, who will turn up in the spring again.

I have gone into this plague of snakes in some detail because it illustrates very well the habits and haunts of our most common serpent, and also because, as far as I know, it is the most remarkable incident of its kind on record in this country.

CHAPTER IV.

SNAKES IN IRELAND IN 1900.

ON November 3, 1900, the following paragraph appeared in 'Country Life':—

"The services of another St Patrick will soon be required in Ireland if reptiles continue to turn up as they have been doing of late. Erin's total immunity from anything in the shape of a snake has been so remarkable that the appearance of two lately in County Wicklow has created quite a stir amongst naturalists. A few days since a snake measuring 20 inches was killed on the estate of Sir Robert Hodson at Hollybrooke, Bray, and just before another was killed on the property of Dr Thompson, near Delgany. These were at first thought to be venomous vipers, but when experts saw them they were pronounced to be the common harmless snake. The only solution of their presence in the snakeless island is that they were brought across Channel in a consignment of shrubs which lately arrived at Hollybrooke. The absence of reptiles from Ireland is a

circumstance which it is hard to account for—if we are not believers in the snake-destroying reputation of Ireland's patron saint. That some nations have an exalted opinion of Irish soil as a warner-off of snakes is well known, and one Irishman in Australia went so far as to import a cargo of earth, which he had strewed over his garden to prevent reptiles visiting it."

Commenting on the above paragraph, the 'Outlook' on November 10, 1900, said:—

"Until the last week or so we had always supposed that Ireland was free from snakes. But according to a paragraph in 'Country Life' this week, two specimens of the common British ring snake have found their way there, and perished as the result of their effort to upset St Patrick's decree of banishment. One was killed on the estate of Sir Robert Hodson at Hollybrooke, Bray. The other had been previously killed on the property of Dr Thompson, near Delgany. The theory advanced to account for their presence is that they crossed over from England in a bundle of shrubs. This is possible enough, though it is more usual for the eggs to be carried about from place to place than the reptiles themselves."

Curiously enough, I saw the quotation from 'Country Life' the day after I had written on my solitary Monnow Valley ring snake for this work (see p. 12). Naturally I was very anxious to get

full and authentic details of the matter, so I communicated with Sir Robert Hodson, who kindly wrote to me as follows:—

"I regret I am unable to give you any facts from my own knowledge, as I was away from home at the time, and the snake having been sent to be preserved, I have not seen it yet. My steward has supplied me with the following facts. The snake was killed by him on October 8, 1900, in a laurel-bush. It was identified by Dr Scharff, of the Museum of Science and Art of Dublin, as belonging to the species known as *Tropidonotus natrix* or ring snake. It measured 26 inches in length:

"The only view I can form as to how this snake came to Ireland, is that possibly the eggs might have come over amongst some *fruit-trees* which I purchased in England *three or four years ago*, and being planted in a warm sheltered position, the eggs might possibly have matured. The snake was killed in the neighbourhood of these trees. It is remarkable that another snake, reported to be of the same species, was also killed in Co. Wicklow this autumn."—
Hollybrooke, Bray, Co. Wicklow, 13th November 1900.

One or two points at once struck me in Sir Robert Hodson's letter as slightly different from the report first quoted. In the first place, the snake was 26 inches long, not 20 inches as reported—that is, it was an older snake than one would have gathered

from the report. Secondly, the trees which came from England were *fruit-trees, not shrubs*. Thirdly, and most important of all, the trees had not arrived lately, but some three or four years ago. It is obvious that these snakes are to be accounted for in one of three ways:—

1. The eggs may have been taken to Ireland in the earth of the fruit-trees, or in the packings, as Sir R. Hodson is inclined to think.

2. The snakes may have been taken over *as snakes* (probably very young, if this were so), either in the trees mentioned or in something else taken to that locality.

3. It is just possible that some person introduced them intentionally, and has been enjoying the joke ever since October 8. However unlikely one may deem this explanation, it must be reckoned with: such things have happened before. Hoping to get some more light on the matter, I then wrote to Dr Thompson of Delgany, where the other snake was reported from. He wrote to me as follows:—

“The specimen of the yellow ringed snake found here on August 12, 1900, was 29 inches long. It was discovered by a farm labourer under a sack of hay in the field when pitching the hay on to a cart. No one could account for its presence in these parts; but I have a shrewd suspicion that as there was a university camp (comprised of boys from English schools) within half a mile from here in 1899, and

as there was a rumour that some of the boys had snakes in boxes in their tents, that probably the specimen taken here escaped from some of the boys the previous summer. It may even have been this year, as the camp was here again, but I did not hear of any of the boys having snakes there this year."

The two snakes were thus evidently about the same age, and might have come from the same lot of eggs. Sir Robert Hodson inclines to the first explanation given above, while Dr Thompson rather suspects the schoolboys of being guilty of this ophidian conundrum. Both views are quite feasible, and one could not decide the question without further evidence.

CHAPTER V.

CORONELLA AUSTRIACA, OR THE SMOOTH SNAKE.

DISTRIBUTION — IN BRITISH ISLES — DESCRIPTION — HABITS—
EXTRACTS FROM REV. O. P. CAMBRIDGE'S PAPER—OCCUR-
RENCE IN BERKSHIRE—LITERATURE.

Distribution.—This species is very rarely encountered in this country, and we are indebted to Continental observers for most of the writings on it. Nevertheless, the smooth snake is now admitted as a true British serpent, and must therefore be included here. I have never come across one out of museums and collections myself, so freely acknowledge my indebtedness to others for the description of its habits and food. A list of references at the end of this chapter will enable those readers who desire to look further into the literature of this snake to know where to find it.

Although so rare in this country, the smooth snake is common enough on the European Continent, more especially in the central and southern countries.

Lord Clermont says that it occurs in Italy, Sicily, Switzerland, Belgium (rarely here), on the right bank of the Moselle river, and in some parts of France. It has been observed in Sweden, especially in the neighbourhood of Gothenburg. Dr Opel obtained a specimen in Silesia, so that its distribution in Europe is a wide one. In England its favourite counties are Dorset, Hants, Surrey, and formerly, at all events, Berks. Mr J. Bevir says in a letter to me that he remembers the smooth snake being found in Berks on several occasions some years ago. He adds, "I have seen three specimens from one locality, but believe that now the species is extinct here" (Berks). I do not know whether these specimens are recorded or not.

Description.—The smooth snake is one of the smaller ophidians, the females averaging about 24 inches when full grown, the males somewhat less in the specimens I have seen. Its colour is variously described as brown, reddish-brown, rusty, or brownish-yellow. No doubt it exhibits a certain amount of colour-variation, as do other serpents. It is marked with two series of irregular dark spots on the back, these spots being more distinct on the anterior portion of the snake. A writer in the 'Zoologist' says:—

"The head is but slightly distinct from the body; the tail short and strong at the base; the eyes small; the rostral plate presses much upon the muzzle, and is of triangular form, with its top pointed; there are



FIG. 8.—*CORONELLA AUSTRIACA*, or SMOOTH SNAKE.

seven labial plates on the upper lip on each side, the third and fourth of which touch upon the eye; the scales of the body are smooth, rhomboid, in nineteen longitudinal rows. The plates on the belly number from 160 to 164, those on the under surface of the tail from 60 to 64 pairs."

Habits.—The favourite food of this snake seems to consist of various lizards, especially slow-worms, and mice. It casts its slough, like other snakes, and hibernates; but the latter process is not so long as in the case of the other British species. Instead of burying itself, it is said to stretch on the surface of the ground. In its disposition the smooth snake is said to be rather fierce, but its bite is quite harmless. Like the ring snake, this species emits a strong secretion when excited.¹

Reproduction.—The smooth snake is viviparous, bringing forth about twelve young ones at a time, near the end of August.

Historical.—In the year 1886 the Rev. O. P. Cambridge contributed a very valuable paper on this species to the 'Proceedings of the Dorset Natural History and Antiquarian Field Club,' a copy of which he has been good enough to send me with



FIG. 9.—
HEAD PLATES OF
SMOOTH SNAKE.
(F, frontal; S, supra-
ocular; P, parietal.)

¹ Afonso, *Natural History (Vertebrates) of the British Islands*.

his kind permission to quote it. The following copious extracts are from the paper in question:—

“ Most people, I imagine, have been hitherto aware of only one other British serpent besides the adder, and that is the common or ringed snake. A figure and general description, therefore, with a few additional remarks on a now well-established third species of British serpent, may not, perhaps, be uninteresting to our members; more especially as its British habitat at present appears to be confined to the sandy heath districts of Dorsetshire and the adjoining county of Hampshire.

“ The first undoubted capture of this snake, *Coronella laevis* or smooth snake, in Britain, was in June 1853, by Mr Frederick Bond, between Wimborne and Ringwood, on the borders of Parley Heath. I was present on that occasion entomologising with Mr Bond. We agreed that it was new to us, and, with little doubt, new also to Britain. Mr Bond took the specimen with him to London, fully intending to get it examined by the British Museum experts; but amid the many distractions of the height of the entomological season it was merely put into spirit and subsequently forgotten, until the record of a specimen received at the British Museum from Bournemouth (where it was found by the Hon. Arthur Russell in 1859) appeared in the ‘Zoologist,’ 1859 (p. 6731). On reading this notice Mr Bond immediately recognised the species we had met with

six years before, and on sending his example to the Museum, its identity was at once established ('Zool.', 1859, p. 5787). During numberless rambles on Bloxworth Heath from 1853 to 1872 I was on the lookout for this snake, but only once saw an example, which I failed to capture. It was not until June 1872 that I succeeded in authenticating it in that locality by actual capture ('Zool.', 1872, p. 3113). Records, however, of its occurrence in the New Forest have been published, in 1862, by Mr F. Buckland in the 'Field' newspaper, where other notices also, I believe, subsequently appeared by the same writer, but without details of time and locality (see 'Zool.', 1869 (2), p. 1658). Since 1872 I have seen it much more frequently and captured it occasionally, in order to have always by me one or two preserved specimens for friends who have wanted it either for their own or for public collections. In the year 1879 it was unusually frequent on Bloxworth Heath. Several were killed one day in September or early in October of that year by a shooting-party, under the impression they were adders. Having been informed of this on the same evening by one of the shooters at a dinner-party, I took a moonlight tramp that same night over the Heath to redeem two of their victims, feeling quite sure (as it turned out) that they were *Coronella laris* and not adders; the next day being Sunday, I feared, too, that before the Monday they would be made prize of by some old carrion-crow or other

vermin. One only, however, proved to be worth preserving, the other having been too much damaged in the anxiety of the slayer to ensure its destruction.

"By the additional records of its occurrence in the pages of the '*Zoologist*,' not only is its authenticity as a British species more than fully established, but its recent comparative frequency (in my own district at least) is undoubted. During the past summer (1885) I have seen it several times, capturing it twice. On each of these occasions a slight tap near, but not on, the head appeared to paralyse it, as it seemed for some time quite dead, though on reaching home some hours afterwards it had quite recovered and was as lively as ever. The first of these two was put into a roomy cage with glazed sides and perforated zinc cover, and a clod of heather to bask upon in the sun, or to conceal itself under. Thus, attended to by one of my sons, and furnished with a small vessel of water and a few bluebottle flies per diem, it lived from June till the beginning of September, always active, retaining its plump well-to-do appearance, and changing its skin once. It became also very tame and docile: if lying under its piece of turf, it would, on hearing my son whistle or call it, come out at once and rear itself on its tail as if to enjoy a little conversation. One day, however, it managed for the second time to push aside with its nose a small ventilating-slide at the side of the cage, and the door of the room being also open, it made its escape into

the shrubbery and was found no more. The other example (captured at the beginning of August) also threw fairly well, but it did not show signs of becoming tame like the other. It was finally sent, on my son's going to school, about the middle of September, to the Zoological Gardens, Regent's Park. I have noticed above that a very slight tap with a stick appeared to paralyse it, but that in the two cases there noted it soon recovered. This was not so, however, with the first example I ever obtained ('Zool.' 3114). In this case the snake never stirred, nor recovered in any way, after a blow, apparently no stronger than those from which the others soon rallied. Mr Kemp-Welch ('Zool.' 3150) also mentions the fatal effect of a slight blow. On the other hand, three examples subsequently taken alive, and which I wished to preserve as specimens, seemed quite unaffected by piercings through the brain with a pen-knife. In these cases chloroform had to be freely used afterwards before immersion in spirits of wine.

"Then with regard to its *food*—that is probably for the most part the sand-lizard (*Lacerta agilis*) : this species is frequent in the same localities inhabited by the snake, though, as proved by Dr Blackmore ('Zool.' 9735), it will freely devour our other lizard, *Zootoca vivipara*, which is also found in some of the situations affected by *Coronella laevis*. In confinement it devoured slow-worms as well as lizards ('Zool.' (2), 1659), but would not touch frogs. Those which we kept in

confinement occasionally devoured spiders, but blue-bottle flies whenever given; so finding that the snakes thrived on this diet, we did not try them with other kinds of food. Mice, slow-worms, and the viviparous lizard are comparatively scarce on our heaths; its food, therefore, with us probably is for the most part the sand-lizard.

"A correspondent ('Zool.' 9559) states that *Coronella laevis* emits a strong odour for defence; but Dr Blaekmore ('Zool.' 9735) says it emits no smell at all, even when irritated. I myself have never noticed any odour in either of the examples I have obtained, so I conclude that if it does emit an odour it is of rare occurrence. Opel states ('Zool.' 9511) that its colour after sloughing is a beautiful steel blue for six or seven days. Each of the two we had in confinement changed its skin, but the only difference I noticed was that they were of somewhat brighter and clearer hue than before. In one of the examples the spots and markings were scarcely visible until after the change of skin. This snake is of a bold and fearless nature; one of those I captured (having come upon it suddenly) reared itself erect on its tail to its full height, hissing and darting out its forked tongue in a very pugnacious way. It certainly seems to me to be much more frequent on our heaths than it was when I first discovered it there; and I often hear of its being seen by others. Its usual habitat is, no doubt, dry sandy spots, but I

have on several occasions met with it in marshy ground and swamp herbage. With regard to its mention in general works on British Reptiles, it is thought by some authorities to be identical with a very young obscure example described and figured many years ago by Sowerby as a new species—*Coluber dumfrisiensis*—found near Dumfries, and noticed by Dr Bell ('British Reptiles,' 1849, p. 60). Dr Bell did not, however, consider it to be a good species; and, on the whole, its claim to be identical with *Coronella lavis* appears very uncertain."

The paper from which the foregoing extracts are taken, and which leave little to be desired from the British field naturalist's point of view, was read on January 20, 1886, at a meeting in Dorchester, and at the same meeting Mr William Penney, of Poole, and others referred to various instances of this rare species being found in Dorsetshire and Hampshire.

In a letter to the 'Outlook' (November 10, 1900) Mr J. Bevir, Wellington College, Berks, whose letter to myself is quoted above, makes a further reference to the habits and distribution of the smooth snake in Berkshire. After stating his view of "the myth" of the adder swallowing her young, the writer goes on to say:—

"In the course of two years I had five specimens of the harmless smooth-crowned snake (*Coronella lavis*), but that is nearly twenty years ago. I think it is extinct in these parts nowadays. It always interested

me from the way in which it hitched on to anything, and remained clinging until shaken off. When one considers also the fact that it is a common snake in Malta, one may possibly have an explanation of the ‘viper’ (Acts xxviii. 3) which came out of the firewood and fastened itself on to the hand of Paul after the shipwreck. It is wonderful the way in which the most innocuous reptiles are described with the Homeric epithet of a venomous snake.”

In the ‘Surrey Magazine’ of May, June, and July 1899, Mr Bryan Hook contributed three articles on the reptiles of that county. He is the first to record the smooth snake there, and the following quotation is from the paper in the June number of the county magazine :—

“The smooth snake (*Coronella austriaca*)—perhaps the most interesting of the Surrey reptiles—is one which, I am told upon the best authority, I am the first to record as occurring in this county.

“In general colour and appearance it so nearly resembles the unpopular viper that doubtless it is usually greeted with the same treatment; at any rate, such was the lot of the first one that came under my notice, the stock of my gun ending its career in a tuft of heather in which it had taken refuge. Had it been in the open I should perhaps have recognised it, and then I should not have had the mortification of knowing that I had destroyed a rare and harmless reptile.

"This occurred in 1891, and not until 1898 did I improve my acquaintance with this species. Early in June of that year I took a specimen alive upon my own land here at Churt, and sent it to the Zoological Gardens in London, where it was still thriving in August last (1898). Another specimen was killed here by mistake in July, and in August my children found a cast-off skin of a fourth specimen. From the fact of three specimens having been noted in one summer, it seems reasonable to conjecture that the creature is by no means rare upon our Surrey heaths, and that more careful observation may lead to its discovery elsewhere."

Apparently Berkshire is not the only locality which the smooth snake has at one time inhabited, only to disappear subsequently, for in 'Science Gossip' of August 2, 1880, there is an article on this species by A. L. Baldry, in which the writer records its former frequency in the neighbourhood of Bournemouth, and its disappearance thence. Mr Baldry says:—

"As I lived for some years at Bournemouth, in Hampshire, formerly its chief habitat, I have had many opportunities of observing the coronella. Twelve years ago—*i.e.*, in the year 1868—Bournemouth was but a very small village, surrounded by large expanses of moorland, intersected with marshy valleys, and was a famous hunting-ground for either naturalists or entomologists. At this time coronella was extraordinarily abundant. During the very hot

summer of 1868 the snakes were to be seen literally in scores, and great numbers were killed. Since then, however, their numbers have gradually decreased, and most of the wild moor having disappeared before the advance of civilisation, they are not now met with in places where they formerly abounded. The favourite haunt of coronella is a dry sandy hillside, overgrown with short heath, and gorse, and coarse grass, and sloping down to a marshy valley, where water is at all times obtainable. There, on some bare patches of sand, the snake lies, loosely coiled, and basks in the sun, and there it can, when thirsty, get water without any great expenditure of energy. During the heat of the day it frequently comes down to some pool in the marsh to drink. Among the undergrowth it can also at any time find its prey, the common lizard, which abounds in such localities. Its mode of obtaining its food is one of the most interesting characteristics of coronella. As soon as it sees its victim within easy reach, it slowly approaches, keeping its body concealed, but slightly raising its head above the heather and coarse grass. When it gets within striking distance, after remaining motionless for a few seconds it darts suddenly, and with the quickness of thought, at the throat of the hapless lizard. If its aim is successful the snake instantly grasps with its tail a stem of heather or tuft of grass, and proceeds at once to the enjoyment of its meal. Its first step is to gradually shift its hold from the

throat to the snout of the lizard, by slow and almost imperceptible degrees. When once it has the lizard's head fairly in its jaws the process of swallowing is rapid, and the strong protests of the victim are wholly unavailing, as the snake with its tail knotted round the grass is able to overcome all resistance. In this way it will in five or ten minutes entirely dispose of a lizard as large round as itself and two-thirds of its length. After its meal the snake is somewhat sluggish, and disinclined to exert itself; but in about a fortnight it begins to recover its appetite, and by the end of another week it is again actively engaged in its search for food.

"While in the viper the markings are all remarkably clear and distinct, in the coronella they are mostly blotched and undefined. The colour, too, of the latter is generally a dull slaty grey or a dusty brown, very different from the rich beauty of tint which adorns the viper. It should, moreover, be clearly understood that although the coronella can, and if irritated will, at times bite hard enough to draw blood, it is not venomous, and possesses no fangs properly so called. Its teeth are mostly hardly larger than those of the lizard, and are barely perceptible without careful examination. But situated at the extremities of the jaws, almost in the throat of the snake, are two long fang-like teeth, unconnected (as far as I can determine) with any poison-glands. Presumably they are intended to aid the snake in holding its prey, and

in defeating the vigorous efforts that, during the swallowing process, the lizard makes to escape."

Mr Baldry concludes a most valuable paper with a regret that naturalists have not given more attention to the close observation of coronella, in which regret I certainly concur; though in the case of a reptile whose

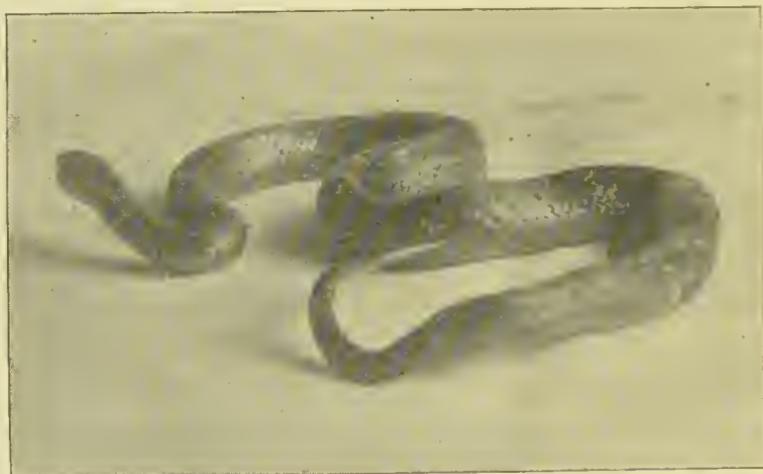


FIG. 10.—*CORONELLA AUSTRIACA*, or SMOOTH SNAKE.

Note—

Shape of head.

Shape of tail.

Steel-blue colour, showing where slough is peeling off.

Absence of markings seen in adder and ring snake.

British distribution is so extremely limited, and whose numbers seem to be decreasing, it can fall to the lot of very few capable naturalists to have the desired opportunity. Still, I should not be at all surprised to find, if the matter were closely investigated, that the smooth snake occurs more generally in the south of England than is suspected.

Those most likely to come across it doubtless destroy it in mistake for the adder, and thus it remains unrecorded.

The smooth snake is hardly ever referred to as anything but the smooth snake in English, except occasionally as the Dumfries snake. But it is given all the following specific names in various writings:—

Coronella austriacus.
Coronella levis.
Coluber ferrugineus.
Coluber levis.
Coronella austriaca.

Coluber dumfrisiensis.
Natrix dumfrisiensis.
Zacholus austriacus.
Coluber thuringicus.

Its classification (other than its specific name) is the same as that of the ring snake (see p. 28).

LITERATURE.

- The Zoologist, pp. 6731, 6787, 9505.
 Bell's Reptiles, p. 60.
 Sowerby's Miscellanies.
 Intellectual Observer, vol. iii. p. 149.
 Lord Clermont's 'Quadrupeds and Reptiles of Europe.'
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 The Field, September 13 and October 18, 1862.
 The Outlook, November 10, 1900.
 Aflalo's 'Walk through the Zoological Gardens.'
 Science Gossip, No. 188, 1880.

CHAPTER VI.

HIBERNATION AND SLOUGHING.

GENERAL—IN VARIOUS SPECIES—QUOTATIONS—CRITICISM.

As the two processes of hibernation and sloughing are common to all serpents, it will be convenient to discuss them in a separate chapter, so that the peculiarities of the different species may be contrasted.

Hibernation.—Hibernation in British serpents means the method they adopt to pass the winter months. It applies to all reptiles which are inhabitants of cool climates. It is precisely comparable to the process of aestivation, which is the summer sleep of reptiles in tropical countries, where the serpents retire in the dry season, to become active again when the rainy season begins. In cool countries, such as our own, hibernation is an attempt on the part of the snake to avoid the extreme cold, when the natural food is impossible of attainment and the general environment such as no cold-blooded creature can tolerate. Snakes are very susceptible to cold, even

when that cold is very far short of the winter temperature. I have often noticed, when snake-hunting in the Monnow Valley, how a change of wind affects the adders. Let a cold east wind strike the slopes of Garway Hill or the Graig, and the adders which yesterday were lying out on the margin of the cut bracken, or on the paths through the woods, are nowhere to be seen. Even the snakiest spots, where one knows the reptiles are, will be searched in vain on a cold day. So repeatedly have I found this to be the case, that now I never go to certain favourite hunting-grounds unless I see that the wind is from a warm quarter. Thus it is that the time of the retirement for the winter varies considerably with the particular season: one year all the snakes will have disappeared by the middle of September, whilst in a warm late autumn they will be found active towards the end of October. In the same way the date of commencing activity in the spring is found to vary according as that season is early or late. F. G. Aflalo¹ mentions that he has "found adders lively in the New Forest in the middle of April, rarely before; but Sir Herbert Maxwell tells me that he has seen them in Scotland as early as March." In Dorset they are generally seen in February. Of course it is difficult to be quite certain as to the exact date, because the snakes may have been moving about in any given district some weeks before any one happened to see one.

¹ Natural History (Vertebrates) of the British Islands, p. 305.

For some years now I have tried to note this point in my own locality, with the result that the earliest date on which I have seen an adder in the spring has been on March 4. For three years in succession I have failed to find one before May—one year as late as May 16; but this is a sparsely populated district, and one might easily fail to hear of the adders moving about for some time after they had finished their hibernation, and still more easily fail to come across a specimen. Considering that in the Monnow Valley we frequently have an early spring, I am inclined to think that the adders are not so late in making their appearance as my earliest note of the fact would indicate. I have never had the opportunity of comparing the different species of snakes *in the same district* as to their relative times of hibernating, as it so happens that the adder is sole representative of the Ophidia in that part of the country where I hibernate myself; so that I cannot express any opinion as to which of our three snakes is the first to retire or the last to reappear. But it is obvious that such a comparison, to be an accurate test of their respective habit in this matter, must be made in a locality where all three British snakes are found. It would be dangerous to assume that because the adder retires in September in one district, and the ring snake in October in another locality, that therefore the adder's period of hibernation is longer or begins sooner than that of the ring snake. The degree of torpor exhibited by the

different species is said to vary, that of the smooth snake being less than that of the adder.¹ Dr Opel observed that the hibernation of the smooth snake was neither so prolonged nor was the degree of torpor so great as in some other serpents. This snake exhibits another interesting peculiarity, in that instead of covering itself up in holes and corners it hibernates on the surface of the ground. In this country the favourite places for adders and ring snakes to choose for their winter quarters are holes in old trees, crevices in rocks, under masses of dead leaves in the woods, in fern or bracken, and, as we saw in the incident at Llanelly, in old quarries. A favourite retreat for adders when hibernating is amongst the roots of gorse. Where these bushes are large a space is formed round the larger roots by the action of the wind swaying the roots about, just as a hole is made with a crowbar. Into these holes both adders and ring snakes will withdraw on being disturbed, and will also hibernate in them. Mr Rees tells me that on one occasion when uprooting gorse near a wood at Gwern Efa, Llantrisant (Glamorgan), for the purpose of clearing the land, a large number of ring snakes were found thus hibernating together.

Frequently they are found entwined together in masses—for warmth, presumably. A correspondent of mine, to whom I owe the knowledge of many interesting adder incidents, writes me the following,

¹ Natural History (Vertebrates) of the British Islands.

which bears on the point of their hibernating in clusters: "A farmer I knew well told me that some woodmen in Reinden Wood, Swingfield (Kent), were in mid-winter excavating under the edge of a gravel pit (I believe to dig out a rabbit), when they came upon an enormous mass of adders in a semi-dormant state. He said there were *hundreds* coiled up together! At the time I did not think much of it, and expressed my incredulity, but he assured me that it was so. That they do at times congregate in considerable numbers I quite believe. When I was a boy I used to spend a few days sometimes at a farm where there was a sloping bank. This had at one time been a cottage garden, but the cottage having been converted into a 'hopoust,' the garden was allowed to drop into an overgrown waste of brambles and long grass, tenanted by rabbits and adders. On one occasion the farm-servants decided to devote the Sunday afternoon to an adder-hunt in this spot. Each one, armed with a stout stick, set to work, when the adders quickly swarmed round them in such numbers that they completely drove the men off the field. They struck about in all directions for a minute or two, and then fairly had to make a bolt for it, and not one of them could be prevailed upon to enter the enclosure again, although they were a dare-devil lot." Even supposing that the farmer exaggerated the numbers a little, there is no doubt that the men did come across a very large congregation of adders hiber-

nating in a mass. The second incident mentioned by my correspondent does not refer to hibernation, but simply to the fact that adders do swarm together.

The physiological condition of a snake when hibernating is very remarkable. Respiration is almost suspended, but the heart goes on beating feebly and irregularly. Digestion is totally stopped, and the temperature of the reptile sinks to that of its surroundings—that is, to the temperature of the protected crevice, hole, or heap of leaves, not the temperature of the atmosphere above. If at this stage the snake be disturbed and roused, death usually results. Extreme cold wakes them sometimes, and being unable to perform their vital processes with sufficient activity at that temperature, they die. No doubt many of our reptiles perish every year from cold in the winter.

It is a somewhat common belief, and one which is found in many books, that the bite of venomous serpents, if sustained when the reptile is roused during its period of hibernation, is comparatively harmless; and conversely, that the hotter the season the more virulent is the poison. This point was made the subject of observation by Dr Guyon, who comes to a somewhat different conclusion. As the result of his investigations, he is of opinion that the matter of *season* or external *temperature* is *not* the most important factor in determining the degree of virulence of the poison. He finds that the most poisonous bite is that from a poison-gland which has been accumulating its

secretion for the longest period. That is to say, it is a matter of "dose"; for a gland which has been storing up secreted poison, say, for a month, will contain more poison than one which has discharged its contents the day before, and consequently will have a more deadly effect on the person bitten. This is doubtless a sound argument so far. But Dr Guyon goes on to conclude that the greatest accumulation of poison takes place during the period of hibernation, "because the animal is in a state of torpor, and does not take any food during that season."¹ Now I confess that this seems to me a very different thing. I quite agree that the bite of an adder which has not used its fangs for some time will be more dangerous than that from one which has emptied its poison-gland of its virulent contents just previously. But I find it hard to believe that the greatest accumulation of venom takes place during the period of hibernation. Consider for a moment the physiological condition of the reptile. The activity of all the functions is reduced to a minimum. The heart just beats feebly occasionally, respiration is almost suspended, the *secretion of the digestive fluids ceases absolutely*, and all chemical change in the body is as nearly non-existent as is compatible with the maintenance of life at all. The secretion of poison in the poison-gland is precisely the same kind of process as the secretion of the bile in the liver—*i.e.*, it is the production of a powerful

¹ M. C. Cooke, *Our Reptiles and Batrachians*, p. 69.

chemical secretion by the vital activity peculiar to that particular gland. Surely when all the other glands and organs in the body are practically at a standstill, one can hardly believe that the poison-gland goes on secreting just the same, independently of the circulation and other body functions. In this country most observers agree that the adder bite during hibernation is comparatively innocuous, and this conclusion is what one would expect from theoretical reasoning on the physiological condition of the reptile during that period of general functional inactivity.

Sloughing.—The process of sloughing in serpents is the periodical casting-off of the external epidermis covering. "This moulting of the skin is effected by its being pushed off by the upward growth of fine, temporary cuticular hairs. On certain parts of the body, as on the under side of the capsular skin and scales of the eyes, these hairs do not develop. After the skin is loosened it dries and is readily shuffled off."¹ It is sometimes stated that the sloughing is an annual process, but I think most observers are now agreed that our snakes cast their slough several times every year. The slough, once cast, is said to be used as an article of diet in some species, but I am inclined to think that is more commonly the habit of amphibians than serpents, though perhaps the latter also do it. M. C. Cooke expressly states that in the case of the ring snake the slough is left on the grass, and I

¹ Packard.

have observed that adders do likewise, and the fact that one often finds portions of sloughs in snaky places proves that the habit of swallowing them is by no means invariable. The ring snake is very irregular in

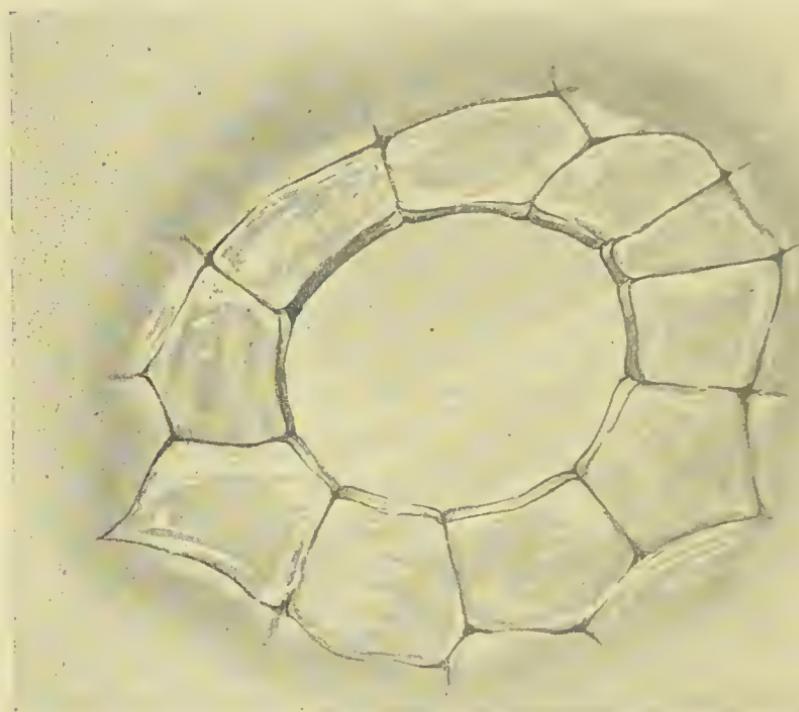


FIG. 11.—EYE-COVERING OF ADDER.

the matter of sloughing, occasionally going through the process as often as five times in a season, with longer or shorter intervals between the different sloughings. Young ring snakes and young adders always cast their first slough very soon after birth. The process begins at the head, the cuticle being

folded backwards over the body, ultimately being left turned inside out. An interesting object is the eye-covering, which is shed along with the rest of the slough, and is seen to be a thick transparent scale, very like an ordinary watch-glass. The accompanying drawing (see opposite page) is from an adder which was sloughing when I captured her. I reproduce it as seen under the low power of the microscope. It is seen to be surrounded by scales of various sizes, in this case ten in number. The scales have a granular appearance, while the eye-scale is transparent.

In *Coronella austriaca*, the smooth snake, the sloughing was very carefully observed by Dr Opel in the specimen he secured in Silesia. He found that this snake cast its slough monthly in June, July, and August, and has no doubt that in its natural condition the first casting would be in April, after the winter hibernation. This snake was in captivity during these observations, and it seems that, following upon the completion of the process, the reptile displayed unwonted energy and excitement.

My own observations on sloughing have been confined to our adders, and after watching them very carefully for some years, I find the process in them varies somewhat from the accounts usually given of the sloughing in the ring snake. Miss Hopley, describing the sloughing of the Ophidia generally, says: "If a snake is in good health and sheds well, the whole process does not occupy many minutes; but if

the skin is in an unhealthy condition, the snake has more difficulty, or makes no effort, and the cuticle comes off in pieces."¹ This supposition that the health of the serpent is the determining factor in the slough coming off whole or in pieces seems to have become widely believed; at any rate, I have often heard it mentioned in conversation. But Miss Hopley's favourite ophidian is the ring snake, about which she has written so much and so delightfully, and she seems to have had this species in her mind when writing the above-quoted sentence. At any rate, I have not found it to be the case in adders, unless the adder population of Herefordshire and Monmouthshire is assumed to contain a very large proportion of invalids, which is hardly likely to be the case, considering the large size they grow to in these counties. My experience with adders is that the slough is more often cast in pieces than whole. The whole process resolves itself into two distinct phases — first, the separating of the external cuticle from the underlying skin; and second, the dropping or leaving behind of the portion to be cast off. The first is a physiological process, explained before; the second is a mechanical process, dependent on external circumstances, over which the snake may have no control. I regard it as almost accidental, when the slough once is loosened from the body, whether it comes off whole or in separate pieces. In other words, it all depends

¹ British Reptiles, p. 27.



FIG. 12.—SLOUGH OF AN ADDER.

on what the reptile happens to rub itself against in its effort to rid itself of what has become an incubus. Should the adder happen to find itself evenly wedged in between two stones, or to have equable pressure exerted upon its sides in crawling through a thick bush, then the slough will peel off entire. But the slough is a most fragile and delicate substance, extremely easily torn, and it must very frequently happen that at one stage or other of the shedding a portion will be ruptured by catching against some contiguous thorn or stone or bramble. When this takes place the resulting slough will not be in one piece but in sections. I have captured a large number of adders while they were sloughing, and in nine out of ten cases the slough was torn partially off before the process was completed. I think this a very usual occurrence, quite apart from the healthy condition or otherwise of the adder. Adders cast their sloughs, as a rule, at least three times every summer, and I have observed that the female is very often undergoing the change of cuticle just before the birth of her young. The tail slough comes off very easily, and is not turned inside out, as a rule, though it frequently is in males. I have on several occasions, after taking an adder that was sloughing, tried to complete the process as one would skin an eel, and on each occasion part of the slough came off in my hand, proving how slight a force is sufficient to tear it in pieces. Moreover, though I have frequently found pieces of adder

sloughs, I have rarely come across a whole one. My own conclusion is, that in the wild state the casting of the slough whole or entire is largely a matter of accident.

A very favourite method of divesting itself of the slough in the ease of the ring snake is to climb into a shrub about a foot or so from the ground. The blaekthorn is much used in this way where it grows. Wedging itself between two branches, the snake then begins a process of wriggling, and in a few minutes the cast slough is left hanging in the shrub.

The east sloughs of both the adder and ring snake are held in considerable veneration in the rustic mind, and are credited with various powers of healing. The particular power ascribed to them varies in different localities. Thus the sloughs are believed to have the power of drawing out thorns from the flesh if worn over the point of puncture; of curing rheumatism if worn as a garter round the knee; of preventing sun-stroke and curing headache if put on round the head.

The young of the adder cast their first slough in the embryo, which can be seen in an illustration in the chapter on the development of that species.

CHAPTER VII.

VIPERA BERUS, OR ADDER.

DISTRIBUTION—DESCRIPTION—AVERAGE SIZE—MARKINGS AND COLOURS—HAUNTS—FOOD.

WE now come to the consideration of our sole venomous serpent in these islands—*Vipera berus*, the adder, or, as it is often called, the viper. It has been explained in chap. i. of this book why this species will be discussed somewhat more fully than was the case in the two serpents already considered.

Distribution.—*Vipera berus* is distributed over almost the whole of the European continent, the extreme north excepted, where the cold is too intense for serpents to flourish. In Scotland it is much more common than the ring snake, while in England its distribution is very various, and will be found under the head of the separate counties, in a later chapter. In Wales it is very common in some places, rare in others. Like the other ophidians, it

is absent from Ireland. It is frequently seen in the islands of Mull and Jura.

Description. 1. *Size.*—Some confusion has arisen in the minds of some as to the size of the adder, from the fact of the small red viper not being regarded as a distinct species, a most excellent work on Natural History thus making the statement that the “average size of the common viper is 10 inches.” The fact of the matter is that the small red viper averages this figure, but the common adder has a very different measurement. A reference to the figures in the various counties will show that the average size of the adult adder in this country varies from 18 inches to 25 inches, according to the locality. When I was working up the Ophidia of the Monnow Valley I was very much struck with the large size of the adders there, and wrote to G. A. Boulenger on the subject. I had then recently obtained a specimen measuring 28½ inches, and was anxious to know what this authority thought of it. His opinion on this matter is probably of more value than any other that could be obtained, as many of the interesting specimens taken in this country go to him at the British Museum. Mr Boulenger says:—

“The usual size of adult vipers in this country is from 20 to 25 inches, specimens of 26 inches being very rare. I have no British example measuring as much as 28 inches. The largest specimens in the British Museum measure—

680	millimetres (tail 70), female, from Crowborough, Sussex.
630	" (" 65), " "
630	" (" 65), " " Cromlin, N.B.
620	" (" 75), " " Lowestoft.
600	" (" 80), male, " Crowborough.
590	" (" 80), " " Cromlin.
590	" (" 85), " " Lowestoft.

Our largest Continental adder measures 700 millimetres. It is, therefore, $\frac{1}{4}$ inch short of 28 inches."

This is a very important point, as the general idea of the size of the adder is that it is seldom more than 18 inches long. I remember a gentleman once solemnly assuring me that any snake in this country which measured over 18 inches was perfectly harmless, and must be a ring snake, which seems to be the usual, but erroneous, idea, and, moreover, a somewhat dangerous one if put into practice. It must always be remembered that not every adder seen is an adult; and it is probably true to say that if an adder be killed measuring less than 18 inches, it is a young one, the parents of which, could they be compared with it, would be found to measure several inches more. Another point in connection with the size is that the female adder in any given locality averages from half an inch to an inch and a half more than the male in length.

2. *Markings.*—The markings of adders are very well defined, and serve at once to distinguish them from the two innocuous serpents. These markings are seen to perfection in a young adult male just after

the slough has been cast. They are the same in general character in the female, but not so brilliant. At the back of the head, which is flattened, there are two narrow dark or black bands, converging to a point on the top of the skull. These two dark bands may or may not join at the point to which they converge; as a rule, they do not quite join. They form the well-known characteristic V-shaped mark, the point of the V being towards the snout of the adder. But this V-mark, although always present in adders, shows endless variety. As I write, there are a number of preserved adders on the table before me, and on looking closely at them *seriatim*, it is noticeable that the mark is slightly different in each specimen—very different, indeed, in some from others. The following drawing (natural size) shows some of these variations. The figures under each drawing refer to the length of the adder to which the marking belongs, measured in inches. These specimens were taken haphazard out of my collection, and they show well that the V-shaped mark is a very varying one. Immediately behind the V—the adder is of a bright yellow colour very often, showing up the dark markings more prominently. Then, proceeding in the description along the back, the zigzag black line is noted, the first patch of which is shown in the drawings. This first patch also varies greatly in shape, but as it goes along the back it becomes more regular. This line of markings is continued

to the tip of the tail; but on the tail itself the marks are often not joined, and appear as separate

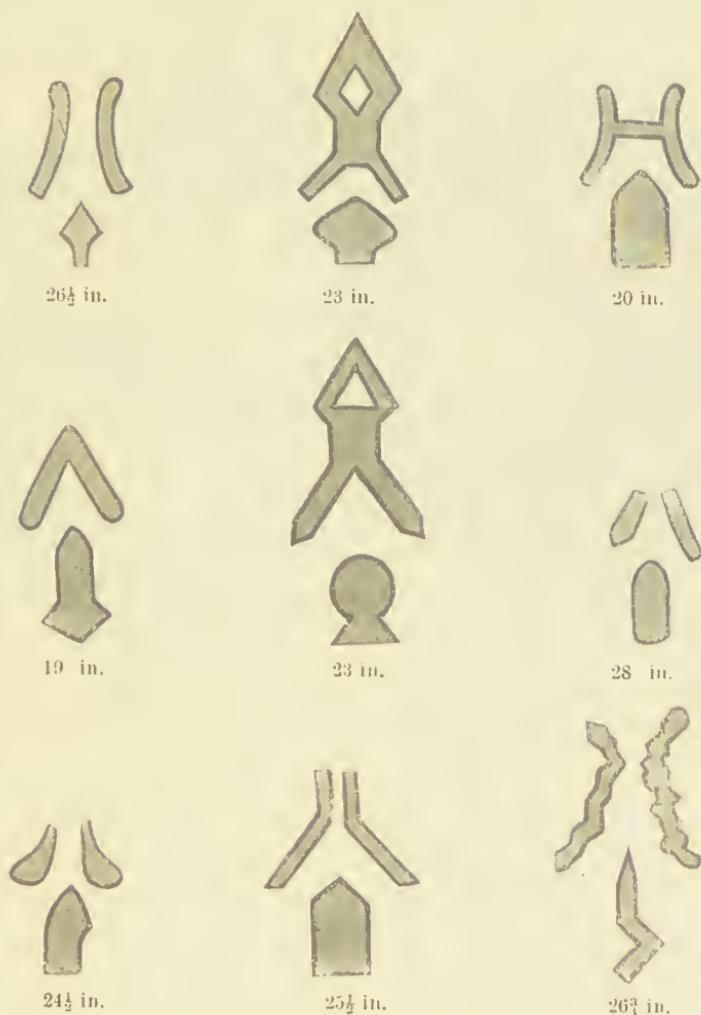


FIG. 13.—V-MARKS OF ADDERS.

black bands running across the back from side to side. Along the sides of the body are two rows of

dark patches somewhat lozenge-shaped, one row on each side. One patch is placed between each point of the zigzag—thus:



FIG. 14.—SIDE-MARKINGS OF ADDER.

These side-markings are extremely variable in shape and intensity, being sometimes almost merged in the general body colour. The lip-scales, which are on the sides of the jaws, are of a bright yellow, numbering, as a rule, eight or nine. The colour of the belly is very varied, there being all shades from deep slate-blue to grey. While the arrangement of the markings is always much the same, the colours of the markings exhibit a wonderful range of variation, which are discussed in a separate chapter.

A REMARKABLE ADDER.

“The late Mr Kirkby of Ulverston once met with the very remarkable viper here figured. He showed it to me a short time before his death. It was taken with his own hands in the neighbourhood of Ulverston, where he lived so long. It was unique in his experience. The ground colour of this snake is uniformly olive-grey. The curious feature is that

the usual zigzag dorsal pattern is entirely absent, and has been replaced by the even ribbon-like black band depicted in the woodcut, which has been drawn from a photograph of the specimen.”¹

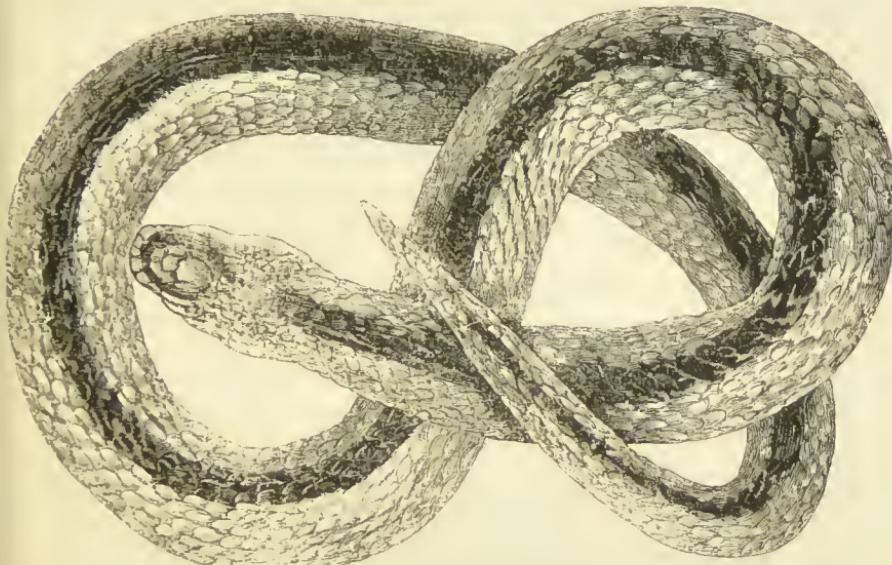


FIG. 15.—BANDED MARKING ON ADDER.

3. *Shape, &c.*—In general appearance the adder is more thick-set than the ring snake, and gives the impression of sturdiness rather than that of sinuosity conveyed by the harmless snake. Some specimens have a very flattened look about them, especially if the skin of the neck and over the gullet is very loose, as it frequently is. If an adder is com-

¹ Fauna of Lakeland, p. lxxviii. Rev. H. A. Macpherson, M.A. The woodcut referred to in the above paragraph is here reproduced by the very kind permission of the author and Mr David Douglas, the publisher of the work quoted.

pared with a ring snake of equal length, it will be seen that the appearance of greater bulk is borne out in their respective weights, an adder of 2 feet weighing considerably more than a ring snake of the same length. The tail of the adder is much shorter and much blunter than that of the ring snake, and is generally about one-eighth of the total length of the reptile, being slightly longer in males than females. The arrangement of the plates on the head differs from that noted in the ring snake, and the head itself is broader and not so rounded.

Haunts.—Generally speaking, the place to look for an adder is the hottest spot in that particular district. More definitely, they occur on commons, on the summits of hills, in woods, in fern and bracken, among rocks and rough stones, on dry slopes, on sandy banks, on the warm side of hedges, on hot grassy banks, on heaths, and especially on chalky soil such as is found in parts of Kent and Dorset. But there are three kinds of places in which adders like to lie above all others. These are, first, on the edge of a "ride" which has been cut through the fern for shooting purposes; secondly, on the warm stones of a disused and unfrequented quarry (splendid places for reptiles are these old quarries); and thirdly, on the top of an ant-hill. Of all the adders I have taken the vast majority have been in one of these three situations. The most likely place of all is a patch of fern surrounded by woods, for there the adders have both summer and

winter quarters to hand. A place of this sort is adapted to the retiring disposition of the adder, for it is, of all animals, perhaps the shyest and most timid. An adder will invariably slip away unperceived if possible, and only when absolutely cornered will it show anything like a fighting attitude. Hence it lies just on the edge of the cut fern or wood, ready to slip under cover at the slightest approach of any noise. If the reptile can be traced into the fern, it is probably found that it goes down one of the runs made by the mice or moles, which run just an inch or two below the surface, covered only by the dead leaves and the last year's fern. I had a most exciting chase after an adder in a run of this sort this summer. I saw the adder lying on the edge of the fern where I had seen it on a previous occasion, but though I crept up as quietly as I could, it disappeared into the fern, which was about 3 feet high. I dashed after it, and pushing the fern aside was just in time to see its tail vanishing down one of these runs. In went my stick, and I tore up the run as fast as I could, but not quite so fast as the adder went on. Twice I got an irritating glimpse of the tail disappearing, and the pursuit went on for some 5 or 6 yards of that run. Then, to my disgust, the run branched into two, and I must have taken the wrong one, for I saw that adder no more. Rabbit-holes, too, are favourite places of refuge. Their retreats in the winter we have spoken of when discussing hibernation.

Food.—The dietary usually given consists of mice, lizards (especially slow-worms), small birds and their eggs, insects, moles, and ant-eggs. To this list I would add the smooth newt, water-voles, and young rats, as having come under my own notice. In the Monnow Valley the staple articles of diet are mice, slow-worms, and, on the banks of the Monnow river, water-voles.

One of the parts of our snake literature which seems

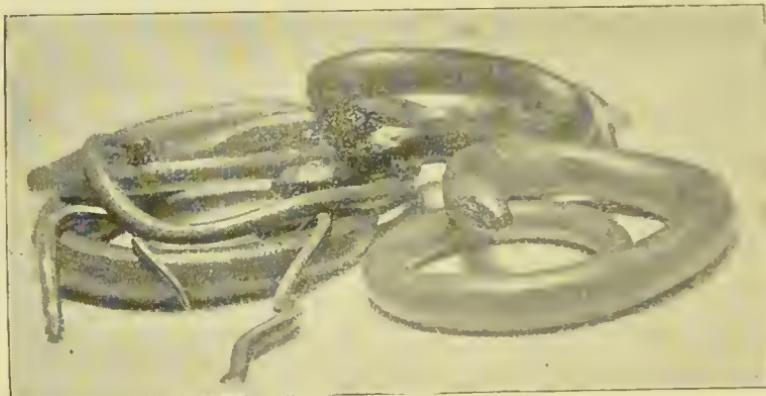


FIG. 16.—SLOW-WORMS.

especially defective is this question of their food-supply and its digestion; and particularly difficult is it to get authority for the statements which are made. There are only two methods of investigation that are of any real value—namely, the actual watching of the reptile feeding out of doors; and secondly, the dissection of the stomachs of adders freshly killed. The former method is almost impossible, as no adder will allow itself to be watched when feeding; so reliance



WATER-VOLE
(undigested).
WATER-VOLE
(partly digested).

FIG. 17.—MALE ADDER (24 in.)
Caught at Skenfrith, June 1898.

has to be placed mainly on what is found in the stomach. The difficulty here is, that digestion is so rapid that the most usual thing is to find nothing at all. Moreover, the adder feeds at more or less long intervals, and the only chance is to get it just after a meal. Any bulky food contained in the throat or stomach can be easily squeezed out without opening the adder. Two years ago (June 1898) I captured an adder in a grass-field on the banks of the Monnow at Skenfrith (near Monmouth). I followed it across the field for about 200 yards, watching its movements and observing its rapidity of progression, which was that of an ordinary walking-pace. On approaching the hedge I secured the adder for fear it should escape me. It was very full, and when I got home I squeezed the contents of the gullet and stomach into a dissecting-dish. The first thing to appear was a young water-vole, quite perfect. This was followed by a second, which showed signs of partial digestion. It looks as if the adder had paid two visits to the water-voles. In the illustration (p. 85) the water-vole on the left of the picture is seen undigested, while that on the right is partially absorbed. This indicates that the adder can retain food in the oesophagus or gullet undigested till it is required to be passed on into the stomach, and explains how it is possible for frogs and toads to have been rescued alive from the inside of adders, as is related. Though generally described as being in the stomach, more probably the frogs and toads were only

in the gullet. It has a bearing, too, on the swallowing of the young, which will be referred to again. If a frog can remain alive in the gullet for some time, why not young adders?

The illustration opposite shows one of the most interesting specimens in my collection. I was looking for a gravid slow-worm in an old quarry a mile from my house, and on turning over a large flat slab of stone about 2 feet square, was much surprised to see a large adder in the act of swallowing a slow-worm. A very one-sided engagement ended in the total defeat of the adder (he was severely handicapped by being in the middle of dinner), and I photographed him on the spot, dinner included. The adder is a male $25\frac{1}{2}$ inches long, and one of the best marked in my collection, and the largest male I have seen. The slow-worm is evidently a young one, and about 4 inches of it is protruding from the adder's jaws, firmly held there by the recurved teeth.

In all probability an adder would take any amphibian as food, if mice and slow-worms were not to be had. I have never actually found any in their stomachs, but I have captured adders in circumstances which looked very dangerous for some newts that were near. On one occasion (16th May 1898) I was on the Tump, Ewyas Harold, Herefordshire, with a friend, when we came upon a large female adder coiled up on the top stone of a heap. Having killed the adder, we turned over the stone

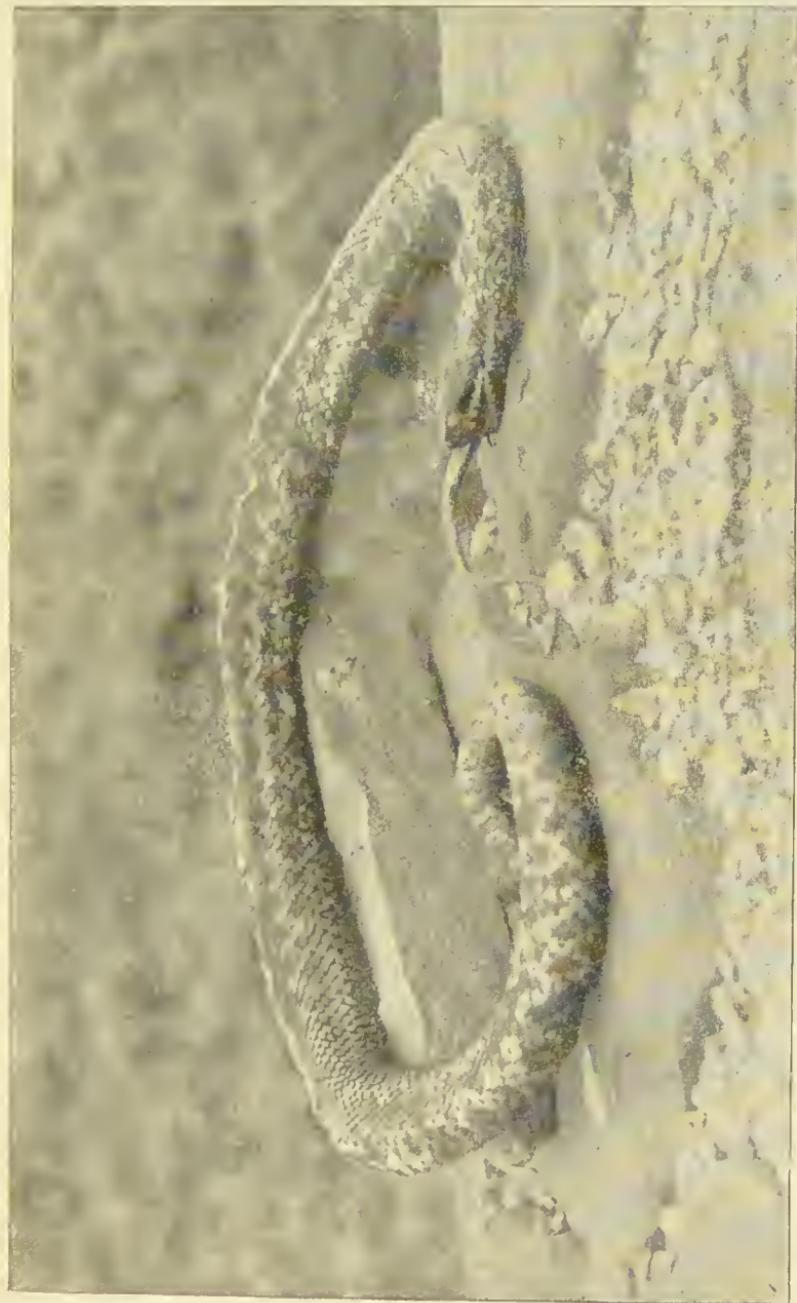
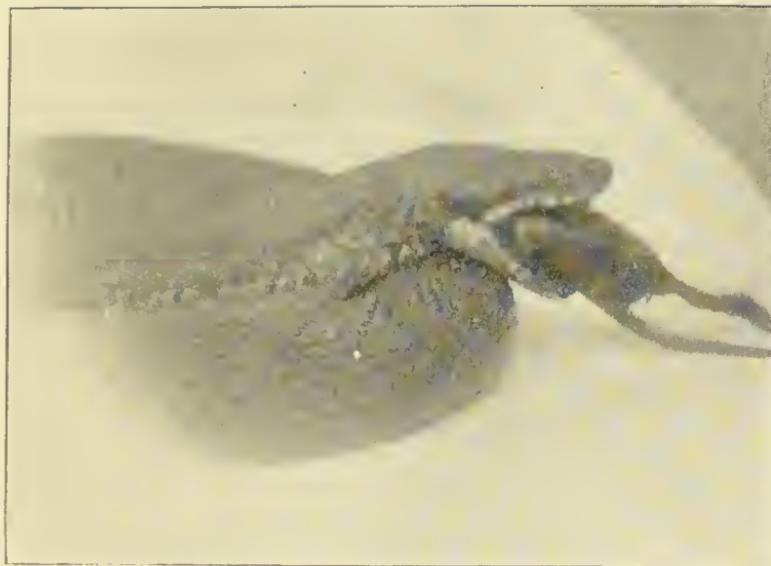
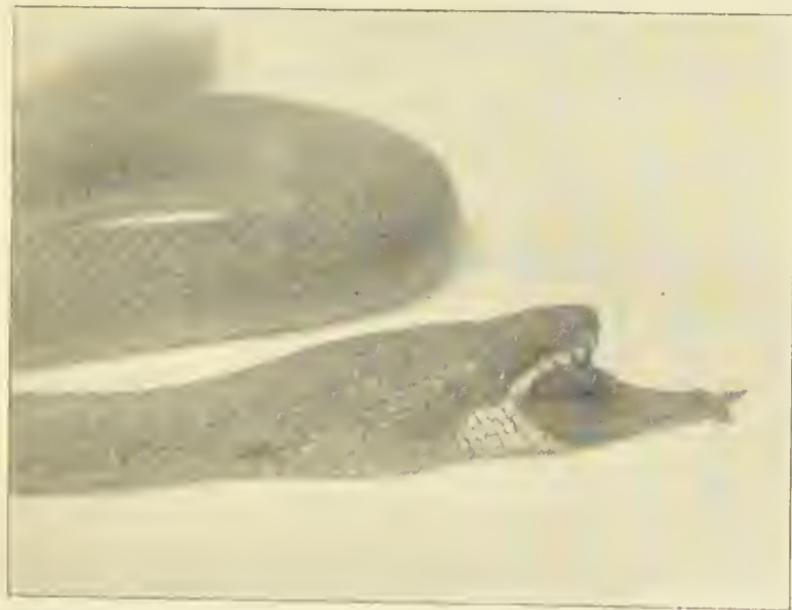


FIG. 18.—MALE ADDER (25½ in.) SWALLOWING A SLOW-WORM. Caught at Grosmont, July 1900.



First stage.



Second stage.

FIG. 19.—THE PROCESS OF SWALLOWING LARGE ARTICLES OF DIET IN ADDERS.

and found a regular collection of reptiles and amphibians. There were six slow-worms and a fine specimen of the great water-newt, *Molge cristata*. Whether the adder knew all that was under that stone or not may be doubted, but if she contemplated swallowing the lot, I am very sorry that we did not come an hour or so later. In the summer of 1900 I killed an adder in Kentehureh Park, which was also lying on a stone under which were three specimens of the small smooth newt; and probably in both these cases the adder was on the point of feeding. The smooth newts are shown in the illustration on opposite page.

How to distinguish the sexes.—At first sight it would appear to be a matter of some difficulty to tell a male from a female adder, but careful examination of a few specimens will soon enable the field naturalist to determine the sex without trouble. External appearances alone are quite sufficient for this purpose, without going into any internal anatomical details. The points to be noted are the total length of the specimen, the length of the tail, the shape of the tail, the number of shields on the body and tail, and the colouration of the adder.

Total length.—In order that this may be of assistance, it is necessary for the observer to know the average length of adders in the particular locality from which the specimen is taken. Given this knowledge, it will be found that the females are from

half an inch to an inch and a half longer than the males in the same place. Thus in South Herefordshire adult male adders average 24 inches, adult females $25\frac{1}{2}$ inches in length. All the exceptionally long specimens that have come under my own notice have been females, but it should be men-



FIG. 20.—SMOOTH NEWTS.

tioned that Mr Boulenger did not find this difference to be constant in a series he examined.

Length of tail.—This is a constant sexual difference, the tail in the males being invariably longer than in the females. Speaking generally, the male adder's tail is 3 inches long, the female's tail $2\frac{1}{2}$ inches. But the length of the tail of course varies

with the size of the adder. "Its length is contained in the total from $5\frac{1}{2}$ to $7\frac{2}{3}$ times in the males, 8 to $9\frac{3}{4}$ times in the females"¹ The tail in the males is not so sharply defined from the body as in females, the whole adder tapering to a point without showing distinctly where the



FIG. 21.—MALE
TAIL (3 in.)

tail begins. In females the tail is much more obviously an appendage, being sharply defined, not so thick, and coming more abruptly to a point. The extra thickness of the male tail is due to the presence in the anterior portion of it of the reproductive organs of that sex. A side view of the tails of the two sexes at once brings the differences in

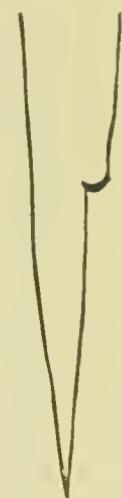


FIG. 22.—FEMALE
TAIL (2½ in.)

the tails into prominence. Diagrammatically they are shown above.

Number of shields.—The male tail being the longer, it is to be expected that the sub-caudal shields in that sex are more numerous than in the female. "The number (counting each pair as one, and not reckoning the terminal, conical, or spine-like shield)

¹ Boulenger, Zoologist, March 1892.

is 35 to 40 in males, 28 to 35 in females."¹ In my own collection I find, as a rule, in the males 38, 39, or 40 pairs of sub-caudals, and in the females very frequently 32 pairs. In the same way the ventral shields vary. In males they are usually from 140 to 144 in number, in females from 144 to 150; but these figures do not represent the limit of variation in either direction.

Colouration.—By far the easiest manner of determining the sex of adders is by the colours in any given specimen. Adders which exhibit a black or dark-blue belly are males, and along with this is often seen a striking contrast of very black markings on a grey or yellowish background. The brownish-green or olive colour with brown markings is characteristic of females, this sex having a tendency to shades rather than distinct colours. Reddish adders with brown markings are also females. The throat is often a sure test of sex. Adders which have the throat scales black or edged with black are males, those with reddish or yellow scales are females.

Bearing in mind the shape and length of the tail, and the more striking colouring of the male sex, there is no difficulty in determining the sex of any adder that comes under notice. Several of the illustrations in this book show these sexual differences.

¹ Boulenger, *Zoologist*, March 1892.

CHAPTER VIII.

THE ADDER—*Continued.*

ANATOMY.

ANATOMICAL POINTS — PLATES AND SCALES — JAWS — POISON-FANG — WINDPIPE — GULLET — STOMACH — HEART, LUNGS, AND LIVER.

Anatomy.—Except that the adder is a poisonous serpent, all the negative characteristics of the Ophidia, which were noted under the anatomy of the ring snake, are again to be remarked in the adder. But there are some positive differences to be noted, and some points common to both these snakes not referred to previously.

Plates and scales.—The plates on the head in this species are more numerous than in the ring snake, and have quite a different arrangement. They are also smaller, with the exception of one large plate between the eyes, often the only light-coloured spot on the top of the head. The position of this plate is shown in two of the drawings of the V-shaped

marking, the two dark limbs of the V dividing to enclose it. This plate is very often a well-marked hexagon. But even this large plate is very variable, and sometimes not much bigger than the others.

The scales which cover the back and sides are small, and all keeled or carinated. Those on the belly are broad, and of very varied colours, according to the sex. They are disposed in a single row until the tail is reached, when the row becomes a double one, the two tail scale rows overlapping each other in the middle line. The last inch or so of these caudal scales is frequently of a bright orange colour on the ventral surface.

Jaws and fangs.—The whole mechanism of the adder jaw has been developed in the direction of perfecting the poison apparatus, and a very wonderful mechanism it is. Apart from this there is the same mobility which we saw in the jaws of the ring snake to allow of the swallowing of large articles of diet. This is attained by the quadrate bones, which connect the lower jaw with the skull, being movable; and also by the free movement of the jawbones with the palate-bones. The lower jaw is furnished with the usual recurved teeth, while the upper jaw, a very short



FIG. 23.—HEAD PLATES
OF ADDER.

(S, supra-ocular; F, frontal;
P, parietal; C, canthals.)

bone, has the fang alone upon it. The adder-fang is about one-third of an inch in length, curved backwards, the extremely fine point directed to the throat. The fangs lie horizontally in a groove when at rest, and only assume the vertical attitude when the adder is about to strike. They can be moved independently of each other, one or both being brought into play as the adder wishes. When the adder is about to strike the lower jaw is opened, the pterygoid goes forwards, the os transversum rotates the maxilla (or upper jaw), and the fang is brought into the striking position.

The gland which secretes the venom is situated at the base of each fang, and has a duct leading from it to the narrow canal through the fang, which has its point of exit just above the sharp point of the fang. In the adder this canal is a closed one, while in some other poisonous species it is merely a groove on the surface of the fang. The poison, which is a chemical one, is driven through the duct and down the canal by the action of the muscles of the lower jaw, the whole process being the work of a moment.

When broken off or worn out, the fangs are quickly replaced by others, the new ones being already developed and lying in the fang-sheath until required. If the adder's jaw be opened widely (after death) and the fangs carefully moved into the striking attitude, the reserve supply of new fangs can be readily seen with the naked eye. (For the effect of the bite see later.)

Tongue and windpipe.—As in the ring snake, the tongue is provided with a strong muscular sheath, and is deeply bifid. It is not often that a photograph sufficiently accurately focussed can be obtained

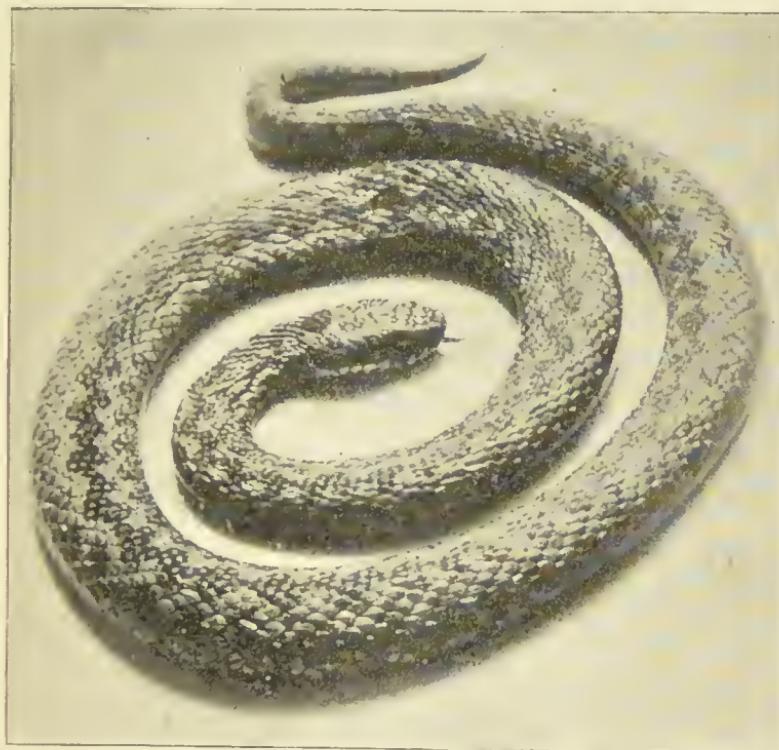


FIG. 24.—ADDER (26½ inches).

Note—

- | | |
|-------------------------------------|---|
| 1. Bifid tongue.
2. Head plates. | 3. Arrangement of scales.
4. Markings. |
|-------------------------------------|---|

to show this distinctly, but it is well seen in the view shown above—a large adder 26½ inches long, captured on the Kentchurch estate. This tongue, though an object of terror to country-folk, is of course only used

for the legitimate purposes of tongues—that is, either for feeding purposes or as an instrument of tactile sensibility. To show how unreliable are the snake-stories that are told in some country districts, the following may be mentioned. I was snake-hunting with my friend F. G. Aflalo in July 1900, and we had as a guide a man who was going to show us the haunt of some adders. He was quite right as far as the adders being there was concerned, but *en route* he told us of an adder in this spot that had once “stung” him, and the sting—*i.e.*, the tongue—went through his leggings! We felt that to attempt to convince him that the adder’s tongue was probably more innocent than his own would only result in his taking no further interest in the day’s work, besides the total loss of our reputations in his eyes, so we listened with all due respect to this and other terrible tales.

The windpipe is long and narrow, ending in the simple sac-like lung. By an interesting anatomical arrangement the pipe can be protruded out of the mouth during the swallowing of some particularly difficult morsel, at which time the appearance of the reptile is very peculiar. This arrangement is also seen in other snakes.

Œsophagus or gullet.—From what was said about the food of the adder it must be quite evident that the gullet is a very capacious organ, capable of considerable distension. So indeed it is. In an adder 24 inches long the average length of the gullet is 9 inches,

the average diameter when distended 1 inch, and the average circumference $3\frac{1}{3}$ inches; so that the total

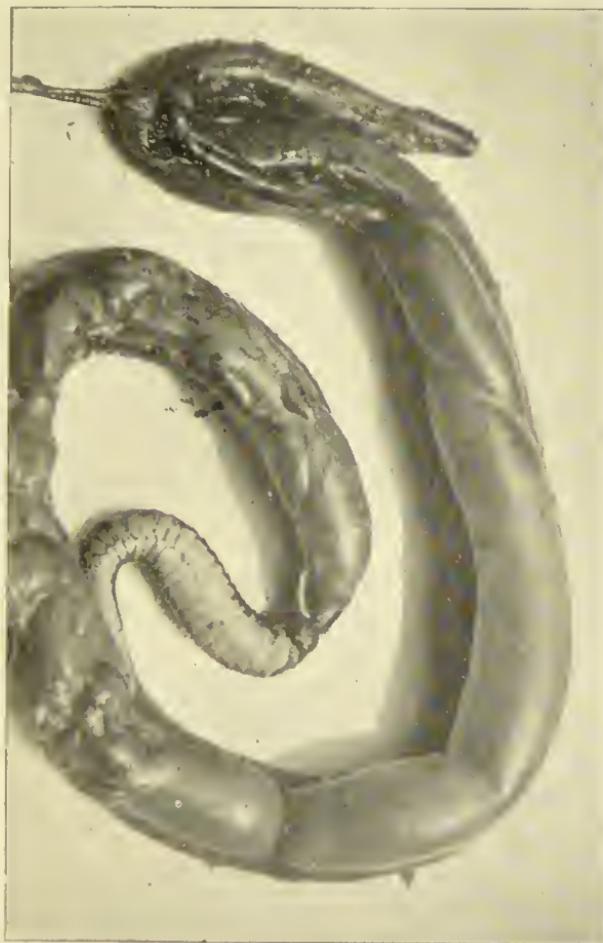


FIG. 25.—GULLET OF ADDER, DISTENDED TO SHOW CAPACITY.

capacity is considerable. It is only divided from the stomach by a slight constriction. (These points are clearly seen in the illustrations of the distended gullet

shown on pp. 101, 103.) The gullet is shown distended with an ordinary blowpipe, and then ligatured at the entrance, and again below the stomach end. Incidentally the illustration shows the double row of scales on the under surface of the tail and the shape of tail in a male. The next dissection (p. 105) shows them even better, and it is distinct enough to count them.

Heart and liver.—The heart is found to lie just about the junction of the gullet with the stomach. It is three-quarters of an inch in length and half an inch thick. Immediately behind it is the liver, the thick end of which lies in contact with the apex of the heart, and the rest of the liver tapers away down the abdominal cavity for 5 inches or so. The respective positions of the two organs are seen in fig. 27. The ophidian heart is three-chambered, consisting of a right and left auricle and a single ventricle. The partition in the ventricle being incomplete, the circulation is necessarily an imperfect one, as far as keeping the pure from the impure blood is concerned. The heart does its best to drive the pure blood to one aortic arch and the impure to the lung for aeration, the mixed blood going into the left aortic arch. Snakes are, of course, cold-blooded.

The liver is a large one, and produces a powerful secretion for digestion. There is a gall-bladder, and also a pancreas.

The dissection on p. 107 shows the heart, lung (distended with a blowpipe), and liver separated from the

Note—
Gullet distended. Blood-vessels. Heart. Liver. Windpipe (by side of heart).

FIG. 26.—INTERNAL ORGANS OF ADDER.





FIG. 27.—HEART AND LIVER OF ADDER.

rest of the body contents. The liver is arranged in a semicircle to reduce the compass of the illustration; *in*



FIG. 28.—DISSECTION OF THE HEART, LUNG, AND LIVER.

situ it is quite straight. The small blood-vessels are seen stretched over the distended simple lung, just as they would be when the adder was taking a deep breath.

The main artery to the liver is seen running along one margin of that organ, and the vessels to the lung can also be traced. Respiration in adders is very slow, and very difficult to count, but I once satisfied myself that a particular adder took seven breaths in a minute. They can, however, do with very little air, and have been known to survive in a closed bottle for a considerable time.

CHAPTER IX.

THE ADDER—*Continued.*

COLOUR VARIATION IN BRITISH ADDERS.

COLOUR VARIATION AND PROTECTIVE COLOURATION—COLOURS FOUND IN ADDERS—FACTORS CONCERNED—HEREDITY—CLIMATE—LOCALITY—SEX—AGE—CONCLUSION.

EVEN a very casual observer of a collection of British adders could hardly fail to notice the great variety of colouring they exhibit. In this chapter an attempt will be made to examine, and if possible to throw some light upon, the causes of these variations. To state the problem clearly it is necessary at the outset to recognise the distinction between protective colouration and colour variation. The former term is used to describe the resemblance in appearance between many creatures and their surroundings, by means of which resemblance the members of the species are protected from attack, and thus the species from extinction. “The disguises worn by animals, the exquisite adaptation of the colours of

their fur or feathers to their surroundings, are part of the general harmony existing throughout nature."¹ Thus every sportsman knows how difficult it is at a little distance to distinguish partridges from the earth on which they are crouching. Many serpents also afford examples of this protective colouration, the British ring snake, for example, being very much the hue of the grass among which it moves and looks for food. But some serpents are most brilliantly coloured, and thus rendered conspicuous. These will generally be found among the poisonous species, whose formidable weapon of defence makes it unnecessary for them to be otherwise protected from attack. Indeed their very striking colours may be regarded as in a sense protective, as giving warning of their presence. But this protective colouration is quite a different phenomenon from that of colour variation. This latter term is descriptive of the varying colours seen in any given species, whether that species exhibits any protective colouring or not.

In the particular case under notice the problem is not to account for the specific markings and colours seen in adders, but, *granting that adders are marked and coloured in a given manner*, why do these colours exhibit such variation? In other words, what is the cause of the striking colour variation to be seen in any collection of British adders?

¹ Packard.

Colours found.—Note first the actual colours that are found to be present in adders. These will be found to fall under two heads: first, colours descriptive of the general appearance of the adder; second, colours that are found only on particular parts of the body. Amongst the first I find all the following terms used by correspondents to describe the general appearance of adders: black, dark-brown, olive-green, warm-brown, coppery-red, dirty pink, brownish-grey, pallid-grey, grey, and almost white. All these terms are correct descriptions of the specimens referred to, so that it may be said literally that adders vary from black to white. But these terms do not refer to the markings, which are generally described as being black, brown, or mahogany-red. In addition to these colours the following may be seen in one or other part of the body: yellow, orange, deep-blue, mottled grey, and pale-blue. The question to be considered is, What determines the presence or absence of any of these colours or combinations of them in any given specimen?

In this connection the small red viper will be dealt with separately, as it is fairly constant in colour, and does not exhibit the variation of the ordinary adder.

Factors concerned.—Bearing in mind the exact question at issue, the factors concerned in the production of colour variation in adders will probably be found to fall under one or other of the following:—

1. Variations due to heredity.
2. " " climate.
3. " " food.
4. " " locality.
5. " " sex.
6. " " age.
7. " " pathological causes.

A careful consideration of these several factors ought to throw some light on the problem. Take them *seriatim*.

1. *Heredity*.—In the case of adders this factor does not help much, for the simple reason that it is but rarely possible to compare any specimen with its parents and grandparents. This could only be done by breeding adders in captivity, thus at once introducing an artificial element which might tend to misleading results. But what is known of the influence of heredity would seem to indicate that it is of little importance in this connection. Thus a case is recorded of a black female adder producing seventeen young ones, only one of which was black, and that one a male.¹ But to be of any value the comparison should be made, not at the birth of the young, but when they have become adult, which, as has been said, is rarely possible.

2. *Climate*.—It is evident that in dealing with a country of the limited size of these isles the climatic

¹ *Zoologist*, March 1892.

conditions can hardly be so diverse as to influence the colours of animals. Hot climates are often associated with brilliant colouring; but this is a matter of protective resemblance, and not the point under discussion. Even if it were shown that adders in one *county* differed from those in another, climate in this country could not be held responsible for that difference.

3. *Food*.—A striking resemblance is seen in some of the lower animals between the creature and its food, in the matter of colour, especially in insects; but this, again, is protective colouration. There is no evidence that I am aware of to indicate that the food of British adders has any connection with their varying colours.

4. *Locality*.—Locality in this connection means the exact nature of the soil and vegetation in a given area. This at first sight seems to afford the explanation sought for; and it should be stated at once that the theory that adders vary in colour according to the place they haunt is the one generally accepted. Personally, I do not believe it to be true, and shall attempt to give good reasons for that disbelief. It comes to this, if the varying colours of adders are due to the locality they haunt, then there is found in a single species an immense variety of instances of protective colouration within a very limited area. Still, it is very natural to suppose that adders vary according to their surroundings. The adder whose habitat is light sandy soil easily answers to the coppery-red or

light-brown description; while those found in dark woods, or on black soil, no less obviously come under the description of black, dark-brown, or olive-green. Very simple, but unfortunately not borne out by the facts. Then the case of the colour variation in fish at once occurs to the mind. I know nothing about fish myself, but no one can live in the neighbourhood of a trout-stream without hearing others discourse on the varying colours of trout. A correspondent of mine, who lives at Newcastle Emlyn, South Wales, where adders are very common, writing on this subject, says: "The varying colours are, I think, due to the actual spot that the adder frequents, and to which they get adapted like a trout. For instance, on open slopes facing the south, they [*i.e.*, adders] get a reddish tinge like parched grass. In the Tivy, trout vary in tint within a few yards. Thus, one taken in a deep rocky pool would be a deep green on the head and back, and one taken a few yards away in a shallow stream would be a light gravelly-golden tint." Now my correspondent is a good fisherman and observant, and doubtless all practical fishermen will agree that what he says of the trout in the Tivy is true of trout elsewhere. Whether he is correct in attributing the variation of trout colourings *entirely* to their habitat, I leave to authorities on piscatorial matters to say. But having noticed this in trout, he very naturally concludes that the case of the adder is analogous. It should always be remembered in science that

analogy is not proof. Forgetfulness of this leads to many an error. Analogy may be good for purposes of illustration or to point an argument, but in itself it can never constitute actual proof.

In this case of the trout and the adder I believe the analogy to be a misleading one. It is a very tempting one, nevertheless; for adders do, like trout, keep very much to the same spot. But the crucial test is this: If the *varying colours of adders are due to the actual spot they frequent, then all the adders taken in any one given spot ought to show the same variety of colouring.* Is this so? As a matter of fact, it is very far from being the case. I have a series of adders before me, all taken from the southern slopes of Garway Hill, Herefordshire, which shows every degree of variation from black to light-brown, and in the same place I once saw, though I did not capture, a white specimen. Half a mile from this place across the Monnow Valley is the northern slope of the Graig Hill, and a second series of adders from this locality shows the *same variations as the Garway Hill series.* Now these two hills facing each other, having opposite aspects, the river Monnow running between, and moreover differing in the nature of the surface (Garway being covered with bracken, the Graig wooded), produce, nevertheless, adders showing the same colour variations. I do not mean to say that I could pick out an identical series of adders from both localities, *because no two are exactly alike, even in the same locality,* which is the very

point at issue. But I do say that adders of *great variety* of colouring are taken in both localities. If the nature of the soil or surface of the ground be the determining factor, then obviously all the adders on the south slope of Garway Hill ought to be the same colour; and a series from this spot should exhibit little or no variation, which is not the case. Curiously enough, this same correspondent mentioned above, a few days after he wrote the letter quoted, sent me three adders from the locality of Newcastle Emlyn. One was particularly light, one was very dark, and the third a medium shade of brown. I do not know the nature of the soil on which they were taken, but the differences may be accounted for without that. The same variety of colouring is found in the Herefordshire adders, the Monmouthshire adders, and those of the Brecknock Black Mountains—*i.e.*, adders on cultivated undulating land, on wooded mountains, and on bare arid slopes. It would be utterly impossible to say from the colour of an adder what was the nature of the ground it lived on, as would be possible if the colour was dependent on that ground. I am inclined to go further and to say, that while the factor of locality may be a very or even an all-important one in the case of the trout, it plays but a small part in the colour variation of adders. The proof of the contention is found in the examination of a sufficiently large series of specimens taken from one locality, when, instead of uniformity of colouring, infinite variety

is found to obtain. So, then, it is neeessary to look still further to explain the problem.

5. *Sex.*—Having briefly considered the possible effects of climate and locality, and having found little or no explanation in these factors, note next the influence of sex and then of age as agents in this production of colour variation. In these two factors are to be found, I believe, the most important modifying influences. First as to sex.

This point is very apt to be overlooked by a easual or non-anatomical observer, simply because unless the specimen being examined were a gravid female, very big with young, the observer would not be aware what the sex of the adder was. A certain amount of special edueation in the adder's structure is neeessary to deeide the question of sex. Now, it is found that the sex plays a very definite part in this eolour question. I have often had an adder brought or sent to me with the remark or message, "It is a beautifully marked speeimen." When such is the ease it almost invariably happens that the *adder is a male*. That is to say, speaking generally, the colours of the males are far more brilliant than those of the females. There are light-eoloured males and light-eoloured females, but the former are brighter than the latter. Also there are dark males and dark females, but the males are blacker than the females in their markings and on the throat.

More definitely still, a brilliant yellow baekground,

with the zigzag line almost black, occurs in the male, but I have never seen that striking contrast of colour nearly so well marked in a female specimen. The general colouring of the female tends to *dull shades*, that of the male to *sharp colours*. Olive-green body and brown markings are characteristic of the female; while the yellowish body and blacker markings are more significant of the males. Such, at least, is my own experience. Here again analogy is suggested. It is almost a rule in nature (except in the genus *Homo* perhaps) that the male is the more attractive in appearance, especially in birds. Thus we have a choice of analogies; but while neither analogy is to be regarded as proof, the one may be misleading and the other correct. It is at least suggestive that in both the amphibians and birds—one group on either side nearly related to the reptiles—this particular attractiveness of the males should be so pronounced a feature. Female adders outnumber the males by three or four to one, and when this is the case in a species, the male is, as a rule, the brighter coloured of the two. The full bearing of the influence of sex can, however, only be appreciated when considered in connection with the other most important factor—viz., age.

6. *Age*.—The difficulty at once arises here, How is the age of any given adder to be determined? I readily admit that after an adder has reached its full growth it is very hard to say what is the exact age in years. Certainly I cannot do so to my own satisfaction; but

any one can readily tell an old adder from a young one by the size and build. But assuming that the specimen to be examined is undoubtedly a young one, how does this affect the colouring? An examination of a few young adders will at once show that the younger the specimens the more well-defined are the colours. By that is meant that black and yellow, green and brown, are seen more distinctly *as separate colours*. Of course the specimen must not be too young to show this—not just after birth that is, for at that time the full pigmentation has not taken place. But observe the young after the first spring sloughing is completed, and what has just been stated will be seen. In the same way suppose that the specimen under consideration is an old one. In this case, too, it is not difficult to trace the effect of age. It is observed that the older the adders the less defined are the colours, and the more blending is there of shades. Further than this, the markings are seen to be less distinct. In an old female there is a tendency to a general greenish-brown colour all over the body, and in very old adders the zigzag line and the other marks are sometimes almost obliterated. Photographs do not give much idea of tint, but they do give some indication of the sharpness or otherwise of colours. Thus in the two illustrations here shown—one a young male, the other an old female—the contrast of bright colours and dull shade is quite distinctly seen. Both adders were taken in the Monnow Valley. Any one

who has observed many adders in nature will agree in this general statement, that old adders are much duller in colour than young ones—the young males being the brightest of all, the old females the dullest of all, in colouring. Adders of the *same age and sex in the same locality* might be very nearly identical; but adders of *different ages and sexes*, though from *the same locality*, will be found to exhibit great variation. Thus age in connection with sex must be considered the two main factors in the production of the varying colours of adders. Locality would seem to have but little influence.

The old female adder shown is a good example of what was just mentioned—viz., the disappearance of the dark markings with great age. She measured $26\frac{1}{2}$ inches in length, so there was no doubt as to her maturity, and the zigzag line is discernible only for an inch or two a short distance behind the neck. The young male is the smallest adder I have taken in the Monnow Valley, being $19\frac{3}{4}$ inches—equal proof of his youth in that locality, where the average length of males is two feet.

All these considerations might apply to other animals, but in the case of reptiles there is another point to take note of, and that is sloughing. Has casting the slough any effect on the colour variation? Strictly speaking, I think not. That is, the colours are not *different* after sloughing, but they are better seen. (The smooth snake is not here referred to.) The



FIG. 29.—YOUNG MALE ADDER AFTER SLOUGHING IN SPRING (19 $\frac{3}{4}$ inches).

brightest coloured of all adders is a young male seen just after casting his slough. So in the female the dull *colour* is seen more distinctly after sloughing. The slough obscures the true colour; it does not aid or influence its production.

7. *Pathological causes*.—The possibility of some very exceptional colouring being due to pathological or unnatural causes must not be overlooked. Disease

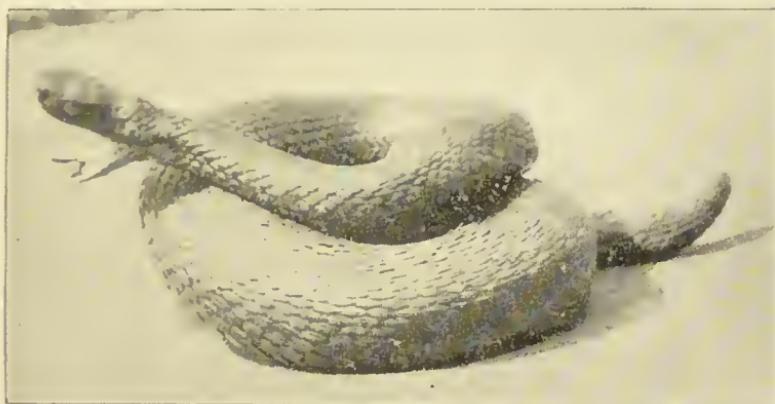


FIG. 30.—OLD FEMALE ADDER (26½ inches long).

might affect it, or the same kind of cause might be operating which now and then one sees the result of in a white pheasant. My own idea is that the white adders are examples of this pathological colour variation. In these cases the true condition is a non-production of colour rather than a variation. White adders occur so rarely that I cannot avoid coming to the conclusion that they are merely abnormalities.¹

¹ Some specimens are bleached from long preservation, not having been kept in the dark.

Personally, I have seen only two, one on Garway Hill in Herefordshire, and the other in the anatomical museum at Edinburgh University, where Professor Sir William Turner drew my attention to it.

This question of colour variation in adders is not an easy one to solve, and a very large series of specimens from different counties must be examined before a definite conclusion is come to. The foregoing arguments are based upon the examination of a series of several hundred adders, taken in such widely differing localities as Dorset, Herefordshire, South Wales, and Scotland, the observations extending over a number of years.

Conclusion.—From the fact of the same variations being found in different places, it is obvious that the causes producing those variations must be acting everywhere. This does not preclude the possibility of adders adapting themselves in some degree to their environment and exhibiting some protective colouration, but the evidence that they do so to any appreciable extent in this country is not satisfactory. In any case, the particular habitat can only account for a certain amount of resemblance; it cannot possibly be responsible for differences found in adders taken in one spot. In other words, even if a locality produces a particular type of adder-colouring (which is doubtful), the same locality cannot account for the variations in that local type. These variations are

undoubtedly a matter of the sex and age of the adder, certain colours pertaining to the male or to particular parts of the male, such as the throat and belly; certain other colours being no less characteristic of the female or parts of the female. The brilliancy or otherwise of these sex colourings is mainly dependent on the age of the adder.

CHAPTER X.

THE ADDER—*Continued.*

THE EFFECT OF ADDER VENOM.

EFFECT ON ANIMALS—ON HUMAN BEINGS—TREATMENT OF
ADDER-BITE—CASES RECORDED—POPULAR CURES.

Effect on animals.—The adder uses its poison apparatus for one of two purposes: either to secure its food or in self-defence. In the case of food the prey is by no means always killed in this way; more often indeed it is swallowed alive, and the poison-fangs only used in the case of large or very refractory articles of diet.

Many animals perish every year even in this country from adder-bite, and probably many that are found dead on hills and commons are really the victims of our venomous reptile. Those most frequently bitten are dogs, sheep, and cattle. Mr C. N. Rogers informs me that in Cornwall dogs are often killed from adder-bite, and that this is more

especially the case with hounds. It can be easily understood why this should be the case, as hounds work with their noses close to the ground, and would be very apt to run over an adder. Probably some of the cases read of now and then of hounds being lost and found dead are to be accounted for in this way, and not always to be put down to wilful poisoning by malicious people. Dogs are generally bitten in the lower part of the leg, just above the foot, or under the jaw. A good many sheep, too, perish annually from adder-bite. In their case the bite is generally under the jaw, or, as I saw in one case, on the udder. The hardness of the hoof is a protection to the feet. This also applies to cattle, which are invariably struck under the jaw. A farmer on Garway Hill, Hereford, this summer (1900) lost a young bullock in this way, and found the adder lying beside its victim—not an unusual habit of the reptile. The adder measured $24\frac{1}{2}$ inches, and was in my possession an hour or two after it slew its last bullock.

In the case of animals the symptoms vary according to whether the dose of venom is a lethal one or not. The venom is a powerful cardiac depressant, tending to stop the action of the heart very soon. If sufficient venom was thrown into the system at the time of the bite to kill the animal quickly, no symptoms will show themselves except a rapid unconsciousness. The two marks where the fangs struck are the only

diagnostic sign, and require very careful looking for. If, on the other hand, the animal be strong enough to withstand the venom, or the dose injected be not so large, symptoms of local blood-poisoning show themselves very quickly. The part becomes swollen and painful and inflamed, and may develop abscesses. This active inflammation reaches its height in two or three days, and then gradually subsides, the animal taking several weeks before it quite recovers.

Effect on human beings.—Cases of adder-bite rarely terminate fatally in adult persons. F. G. Aflalo mentions, however, that Dr Stradling had records of five fatal cases.¹ The same author states that “on the whole, men and monkeys succumb more frequently to snake-bite than other animals.” In localities where the small red viper is found, its bite is supposed to be particularly noxious. The effect on man varies with the healthy condition or otherwise of the person bitten; but this is the case in any other kind of wound. Most of all does the result depend on the actual amount of venom injected into the circulation. The bite nearly always takes place before the person is aware of the proximity of the adder—either through treading on it or in picking up something on the ground, not seeing the adder there; or in some such accidental manner. Very rarely is it the result of a deliberate attack on the part of the reptile, which is doing its best to elude notice.

¹ Natural History (Vertebrates) of the British Islands, p. 306.

Only when absolutely cornered does the adder turn to attack—for example, when in a box or something of that sort. The part most likely to be the seat of the bite is therefore the hand or the foot: especially does the adder appear to aim just above the ankle, if nearly trodden upon. On examination the skin shows the two points of puncture made by the two fangs, looking like two severe pin-pricks. In doubtful cases the presence or absence of these marks must decide the diagnosis. The symptoms, which come on very rapidly, are, pain at the seat of the wound, sickness, and a feeling of extreme prostration, terminating in actual fainting and loss of consciousness. In fatal cases death occurs soon from heart failure. If, however, the dose injected was not so large, or the venom of the particular adder less potent, the patient recovers consciousness (or may not actually faint), and a set of secondary symptoms set in. The day after the bite the vessels of the arm or leg, as the case may be, become painful, and the lymphatics stand out as dark lines. The limb becomes swollen, and the swelling may extend to the body. The patient, in fact, exhibits all the signs of severe local blood-poisoning, in addition to great weakness of the heart. In some cases the limb shows considerable discolouration, more or less of a green colour. The symptoms then gradually subside, but the patient is some weeks before feeling quite the same as before the accident.

One of the few recorded fatal cases of adder-bite is that published in the 'British Medical Journal' of July 15, 1893, by Dr P. P. Jennings and Dr R. C. Fraser, from Llwynypia, Glamorganshire. As this case was observed in great detail by these two medical men, it will be well to reproduce it here, minus the technical terms used in the strictly medical report:—

"A. B., aged 11½ years, whilst playing on the side of a mountain in Glamorganshire on June 3, 1893, was bitten by a snake. He saw a bird resting on a fern, fluttering its wings; for the purpose of capturing it he extended his hand, and was immediately bitten by a reptile lying concealed. The bite was at once sucked by some one who had witnessed the incident, and the boy ran homewards.

"He was seen professionally within three-quarters of an hour following the receipt of the bite. At this time he presented two distinct punctures, situated about one-tenth of an inch apart, on the middle of the right forefinger. There was no swelling, no tenderness on pressure, no complaint of pain in the finger. The case was regarded as a bite from an ordinary 'mountain snake,' and was treated accordingly. The boy appeared to be of particularly robust physique for his age."

"At 5 P.M.—an hour and a half after being bitten—he was decidedly drowsy, and gave evidence of great pain in the affected finger on being roused; vomiting had taken place; his temperature was

normal; the right hand was swollen; the pupils of the eyes were widely dilated, and reacted to light.

"At 8 P.M. the hand and forearm were very dark, swollen, and brawny; there was excessive tenderness on pressure; extension to the arm was evident. The pulse, temperature, and respiration were normal; he was still vomiting. His drowsiness had completely passed off, the mental faculties being wholly undisturbed; he complained of great thirst and of severe pain at the site of the bite.

"At 8 A.M. it was found that there had been progressive extension of the swelling and duskiness of the involved tissues during the night. The whole of the limb and a portion of the right side of the chest and the side of the neck were implicated; tenderness and pain were aggravated. The surface of the body was cold, the pulse very weak; all food was vomited, and his mind was quite clear.

"At 2 P.M. the upper part of the abdomen on the right side had become affected. His face was blue and had an anxious expression, and he was covered with a clammy perspiration. The pulse at the wrist could not be felt, and the beating of the heart was very faintly felt. The temperature in the armpit of the affected side was 101°, in the opposite armpit 98°. Mentally the boy was still quite undisturbed. The breathing was slower. The pupils were still dilated and reacting to light.

"At 7 P.M. information was received to the effect

that he was ‘very much better, and the parts were not so black.’ When seen, however, this improvement was found to be fallacious. There was less discoloration, but except that his mind remained clear, all the symptoms were aggravated.

“From this time towards midnight he continued much the same. Death occurred at 1 A.M. Consciousness was retained almost up to the moment of his decease. There had been no convulsions at any time in the illness.

“Naturally the main interest in this connection is the determination of the exact type of reptile. Presumably it belonged to the adder species. In any case, the great weakness of the heart’s action, and the slowing of the breathing later, coupled with the absence of mental disturbance markedly shown throughout, are facts of great interest.”

The following letter appeared in the ‘British Medical Journal’ of July 29, 1893:—

“The case of fatal poisoning by snake-bite in Glamorganshire, reported in the ‘British Medical Journal’ of July 15, is of great interest, inasmuch as authenticated instances where this injury has terminated in death are extremely rare. Indeed Professor Bell, in his work on British Reptiles, expresses a doubt as to whether a fatality from this cause has ever actually occurred, he having been unable to trace any quoted case to a valid source. As

a matter of fact, however, I believe that this is the fourth which may be regarded as vouched for by competent authority in Great Britain. Death from a snake-bite is more commonly heard of on the Continent, but is there invariably due to another species of viper, though one which is closely allied to our own. Nevertheless, many bitten persons who have recovered from all primary symptoms produced by the poison eventually succumb to its influence in remote indirect effects at a later period.

"Drs Jennings and Fraser state that the fangs' wounds were one-tenth of an inch apart. If this be so, it should stamp the aggressor as a very small specimen; two-fifths, or even half an inch, would more nearly represent the interval between the punctures inflicted by a full-grown viper. In the bites of these serpents which possess erectile fangs, the breadth of surface included is often a little greater than the space which separates the teeth, as they lie quiescent in the mouth, a fact which I have repeatedly verified where tropical Viperidæ and Crotalidæ were concerned. But it very frequently happens that one fang misses altogether where the finger is struck. One mark only would then, of course, be visible, but it would not follow that the symptoms must necessarily be less severe. That no pain should be felt for three-quarters of an hour is certainly unusual; the rest of the phenomena described are characteristic enough; there is often little or no mental disturbance.

"The reptile does not appear to have been secured, but is ascribed 'presumably to the adder species.' Now, of the three snakes inhabiting this country, one only is venomous (*Pelias berus*), the 'little viper' of France and the Continent generally.

"Your correspondents say that the case was first looked upon as one of a bite of an 'ordinary mountain snake.' If by mountain snake is meant the common ringed or grass snake, it would be deeply interesting to know, both as a question of natural history and as a point of possible importance in diagnosis, whether they have ever seen or heard on good authority of this creature biting.

"It will hiss furiously on the smallest provocation, and its odour when enraged is something appalling; but though I have handled hundreds, perhaps thousands, of them in the course of my life, I never experienced a bite from one, nor have I ever met with any one whose testimony was otherwise. And I am not acquainted with any other member of the serpent tribe of which the same thing can be said, although I have 'gone in' for reptiles all my days.—I am, &c.,

ARTHUR STRADLING, Watford."

My own experience with the ring snake coincides with that of Dr Stradling. Though this species will hiss volubly and open its mouth when caught, I have never known it attempt to bite, even when a finger was offered to it.

Another fatal case has occurred quite recently (June 1901) in Cumberland, where a little boy named Hartley, aged four years and eight months, was bitten on the leg by an adder. In this case death took place three days after the accident. Owing to the long distance to be travelled, it was some hours before medical aid could be got, and though cardiac stimulants and permanganate of potassium were injected, the patient gradually succumbed to the effect of the venom.¹

The following description of a case of adder-bite has been sent me by my neighbour, B. St J. Attwood-Mathews, Esq., Pontrilas Court, Herefordshire, and is quoted in his own words:—

“In the year 1846 or 1847, I forget which, I was walking on Jansley Moor, near Matlock, Derbyshire, on a hot day in the month of August. I had caught an adder about 2 feet long and put it into a box. On opening the box soon afterwards the adder bit me in the right forefinger. I shut up the adder again in the box, and tried to suck the venom from the wound. This was of no use, and soon I became very faint and sick, and fainted by the roadside. There I was found by some passers-by, who helped me into a gig and drove me home. I went to bed and had my arm covered with cloths steeped in ammonia. The arm swelled up to twice its natural size, and the swelling extended

¹ I am indebted to Dr Eden Cass of Ravenglass, near Carnforth, who attended the case, for kindly furnishing me with particulars of this fatality from adder-bite.—Author.

a little down the side. There was very great discoloration. It was about a week before I was able to use my arm, and the elbow remained stiff for a couple of months."

Treatment of adder-bite.—The treatment to be of much avail in a severe case must be prompt and heroic. It may be divided into two—namely, that at the moment of the accident; and the after-treatment. These may be summed up as follows:—

- A. *Immediate treatment.*—1. A free incision into the flesh at the point of the fang-punctures.¹
2. Sucking the wound, provided that there are no sores on the lips or in the mouth.
3. Applying a tight ligature above the part where possible (to prevent the absorption of the venom into the system).
4. The internal administration of large quantities of stimulants (brandy, whisky, or ammonia).

The first three of these, to be of any use, must be carried out *immediately*.

- B. *After-treatment.*—1. Continued administration of stimulants.
2. Hot fomentations to the swollen limb.
3. Opening of any abscesses that form.
4. Heart and other tonics, according to the course the case runs, at the discretion of the medical attendant.

¹ Permanganate of potash has recently been advocated, rubbed into the incised wound.

The immediate treatment is directed to the prevention of the venom being absorbed into the system; the after-treatment to keeping up the strength of the patient, and the relief of local conditions. The important point to remember in dealing with a case of adder-bite is that the fangs penetrate sufficiently far into the tissues (or may do) to throw the dose of venom *directly* into the circulation, and so affect the heart in a very short time. Take prompt action, and do not be afraid of doing too much.

Adder attitudes and movements.—Connected with the subject of adder-bite is the question of the attitude of the adder when about to strike. From experience I can say but little, as I have only had an adder *face me* on one occasion, and then I prevented any further movement on her part. But very extraordinary statements are made about the way adders spring and jump. But very few people have sufficient command over their nerves to observe an adder's movements very closely, if they are under the impression that the reptile is about to strike at them the next moment; and with all respect to those who have written to me on this point, I am inclined to think most statements made on the matter are a little exaggerated. It may be quite possible that, under the influence of great fear or excitement, a sudden spasmodic contraction of the muscles in a certain way might cause an adder to project itself a few inches off the ground (somewhat in the same way that a stunned

rabbit throws itself up when lying on its back), but

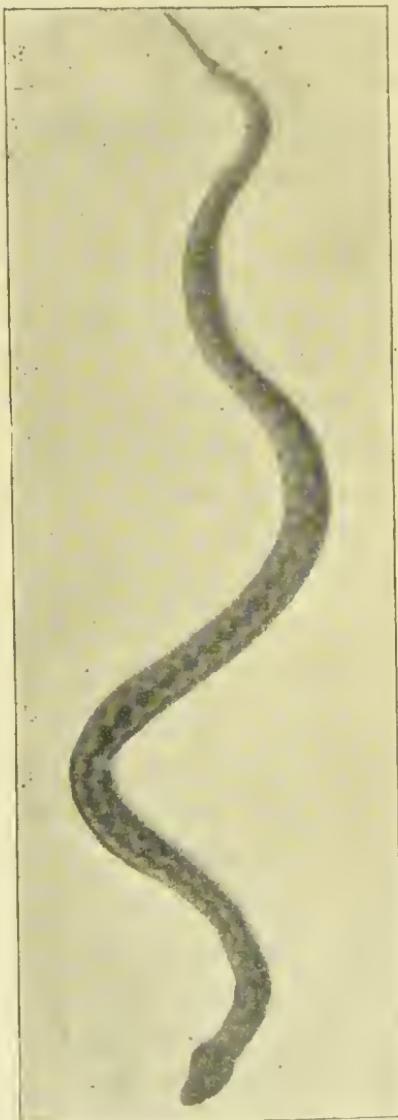


FIG. 31.—ADDER IN MOTION.

I have never seen even this much myself. But the adder's anatomy is not such as to permit it to do more than raise itself up on to the tail as a voluntary act, and as a rule it may be said that the reptile always has some part of itself on the ground. Still I am quite aware that some say otherwise: witness the following:—

“One of my workmen told me that an adder sprang at him as high as his waist, but he managed to dodge it, and it just missed him” (letter from W. Jacob).

Again, “I was very near putting my foot on a large dark-coloured female adder when she *jumped* right at me, and hissed” (letter from a gamekeeper).

The ordinary motion of the adder in progression is

a sinuous wavy movement from side to side, well seen in the accompanying illustration (p. 138). This attitude in motion is also shown in the figure of the handsome young male adder depicted on p. 121. When stationary, adders are usually seen curled up in two or three coils (see p. 99); and this attitude is also assumed prior to the act of darting the head forward to strike. This latter is done with extreme rapidity, and frequently repeated a second time. The ordinary sinuous movement is carried out by the action of the muscles on the ribs and on the ventral scales. "The large ventral scales are successively advanced, the hinder edges of the scales resting on the ground and forming fulera; resting on these, the body is then drawn or pushed rapidly forwards."¹ Each scale is attached to the rib corresponding to it, the whole mechanism being a very beautiful one to watch in operation.

Cures for Adders' Bites.

In most parts of the country where adders are at all common, there is some popular method of treating their bite. Perhaps the most usual is an oil made from some part of the adder, or from the melting down of the whole reptile. Sometimes only the liver is used to make this oil; at other times the faith is put in the adder's fat. In the Monnow Valley I have heard of

¹ Packard.

the fat being cut out of the adder immedately after the bite has occurred (presuming, of course, that the adder was killed), and forthwith applied to the wound. In some parts of Surrey, I am told, the shepherds always carry a bottle of adder-oil to apply to any sheep that may be bitten. The applieation of sweet-oil to the bite, or its internal administration, is often to be found recommended, the idea being that the oil is supposed to have some power of preventing the absorption of the venom. Personally, I should not like to depend on the effieacy of oil to counteract the effect of a poison which has been injected directly into the eirculation ; and oil is one of the things I dispense with on an adder-hunt, though I do like to have a sharp lance and some powerful stimulant at hand. In some parts of Scotland quite a different method of cure is trusted to, based on more Scriptural grounds. This plan is mentioned in a paper read by the Rev. George Williams, Perthshire, on Deeember 17, 1900, before the Stirling Natural History Soeity. He there says : "The Moss of Boquhapple is a favourite nursery for adders. A man having been bitten by one of these poisonous animals, John Marshall (who died a few months ago) was instantly despatched to feteh a *live pigeon*. The bird was torn to pieces, and the warm flesh was applied to the wound *to extract the renom* : beecause the flesh of the gentle dove is totally antagonistic to the poisonous bite of the viper's brood—an exception to the old medical principle, 'similia simili-

bus curantur.' John Marshall assured me that the man recovered splendidly and speedily."

It seems almost a pity to add that Mr Williams's paper was entitled "Local Superstitions."

Our ancestors had some very interesting methods of ridding localities of adders and of curing the bite, and in some ancient books there are some appalling prescriptions to be found. The following are from a work published in the year 1792, the author being William Augustus Osbaldestone, Esq., the volume being entitled 'The British Sportsman, or Nobleman, Gentleman, and Farmer's Dictionary.' Under the heading "Adder - Stung" these remedies are mentioned :—

"*Ointments.*—I. Garlie, onions, bacon, and baysalt, stamped together.

"II. Stamped rue, mustard-seed, pickled herrings, and blaek soap, with a suffieient quantity of deer's suet or bear's grease.

"III. Cover the wound with Veniee treaele or mithridate: either of these arc very good, espeially if the spirituous embrocations used for gangrene be also used.

"IV. Dragon's blood,¹ barley-meal, and whites of eggs, mixed to a thick consistence.

"Solleysel recommends the following remedy, whielh indeed is not improper, only that the seareity of the chief ingredients renders the preparation very dear in

¹ Dragon's blood refers to the name of a plant, I fancy.

this country, and rather difficult to be attained: Two or three ounces of the powder of dried adders and two ounces of adder's oil, mixed in a pint of canary, and repeated several times. As soon as the malignity and venom are destroyed, treat the sores as wounds or ulcers."

Which Mr Osbaldistone considered the most expensive, and the harder to get,—the adder's oil, or the pint of canary,—is not stated. Perhaps the latter was dear, the former not easily to be had. In another part of this interesting old book he writes:—

"*Snakes and Adders.*—To drive them from the garden, plant wormwood in various parts of it, and they will not come near it. Or smoke the place with hartshorn, or lily roots burnt in a fire-pan, and they will fly from the place. Or old shoes burnt, or other stinking stuff, will drive them away; or ash-tree boughs, while green leaves are on them, laid about your ground will have the same effect. Or, take a handful of onions and ten river crabfish, beat them well together, and lay it in the place where they come, and you may kill many of them together."

Of these remedies, it can quite be believed that the burning of old shoes would be very effective in driving away the most intrusive adder; but, unfortunately, no respectable person would care to be in that spot either as long as the fumes were at all potent, and when that effect had worn off the adders might return too.

CHAPTER XI.

THE ADDER—*Continued.*

THE REPRODUCTION OF THE ADDER.

PAIRING—TIME OF BIRTH—NUMBER OF YOUNG—NAKED EYE DEVELOPMENT.

Pairing.—Female adders are more numerous than males, in the proportion of three or four to one. The process of the fertilisation of the female eggs by the male takes place soon after the winter hibernation is over—that is, in the month of April or early in May. At this time it is a common occurrence to see a male and a female adder lying together on a warm sunny bank, and I have seen as many as seven adders all in a heap. Should a single adder be killed at this time, careful watching for a day or two will generally result in the discovery of the mate in the same spot. The term “bunching” is applied to adders at this time in some districts, from the fact of their being seen or

killed when curled up together;¹ and a correspondent tells me that he once struck at an adder with his stick at this season, and not until he had killed the reptile did he notice that there were two together. Several farmers have told me that they have often killed an adder, and on setting fire to the gorse-bush or thicket by which it was lying, a second adder was driven out by the heat. It is a practical point worth remembering, that should an adder be encountered in the spring, it is well to keep a look-out for a second specimen in the same spot.

Time of birth of the young.—With all deference to a writer in a well-known encyclopædia, it is hardly the case that the adder “brings forth in April or May” her family—at any rate in this country. The process of development takes about four months, and as the pairing occurs in the spring, the young are born in late summer or autumn. This of course refers to adders in their natural habitats, not in captivity, where the conditions might be different. The first two weeks in September are perhaps the most frequent date of birth, varying a few weeks with the season and locality. At this time the females become very sluggish in their movements from the weight they have to carry, and can be captured with greater ease than at any other period of the year, if they can be found. But just before parturition takes place

¹ “Bunching” is also used to refer to a mass of adders hibernating together.

they are apt to retire to a warm secluded spot, there to await the advent of their offspring. I noticed this particularly in the case of three females that I had been watching for a couple of months in their haunt. During July and August they were always to be found on a warm afternoon sunning themselves in the same spot; and by sitting very quietly a little distance off, with a good pair of field-glasses, they could be observed without much difficulty, by the exercise of a considerable amount of patience, a virtue the absence of which is fatal to any success in the observation of adders in nature. But at the end of August they vanished into the fern and were seen no more, to my great disappointment.

The average number of young.—It might be imagined that on this point there would be some degree of agreement amongst various authors. Instead of anything like unanimity prevailing, however, most widely varying figures are given in different books. The three following estimates are from three modern works. The adder is said to bring forth at a birth young to the number of from 5 to 14, from 10 to 20, and from 15 to 40. The one estimate may almost be said to begin where the other leaves off. The minimum figure in the last estimate is greater than the maximum of the first, and the maximum of the first less than the minimum of the third, while the maximum family allowed in the second case is exactly half of that given in the third-quoted esti-

mate. It is manifestly impossible to reconcile such varying statements as these, unless one lumped them all together and said that the adder family varies in number from 5 to 40, which would be very apt to convey the impression that very little was known about it. An author can only give his own opinion and the reasons for arriving at it, which latter point is too frequently omitted. People often say that they once killed an adder which had its young ones playing about it, the young numbering about such and such a figure. These figures are of necessity a very hasty estimate on the part of the observer, made, moreover, at a very exciting moment. It is not an easy matter to count a number of young adders scuttling away and at the same time keep a careful eye on the mother; and very little reliance is to be placed on this kind of haphazard evidence. There is only one reliable method of observation applicable to adders in a state of nature, and that is the dissection of a sufficiently large series of gravid female adders shortly before the time of parturition.¹ This condition of the female may be found, as has been said, in the month of August. At this time the embryo adders are well on in development, and can be handled and counted with ease and accuracy. They are several inches long, according to the stage of development, and every embryo that is to be born can be taken out of the egg.

¹ This is also the method adopted to determine the relative proportion of the sexes.

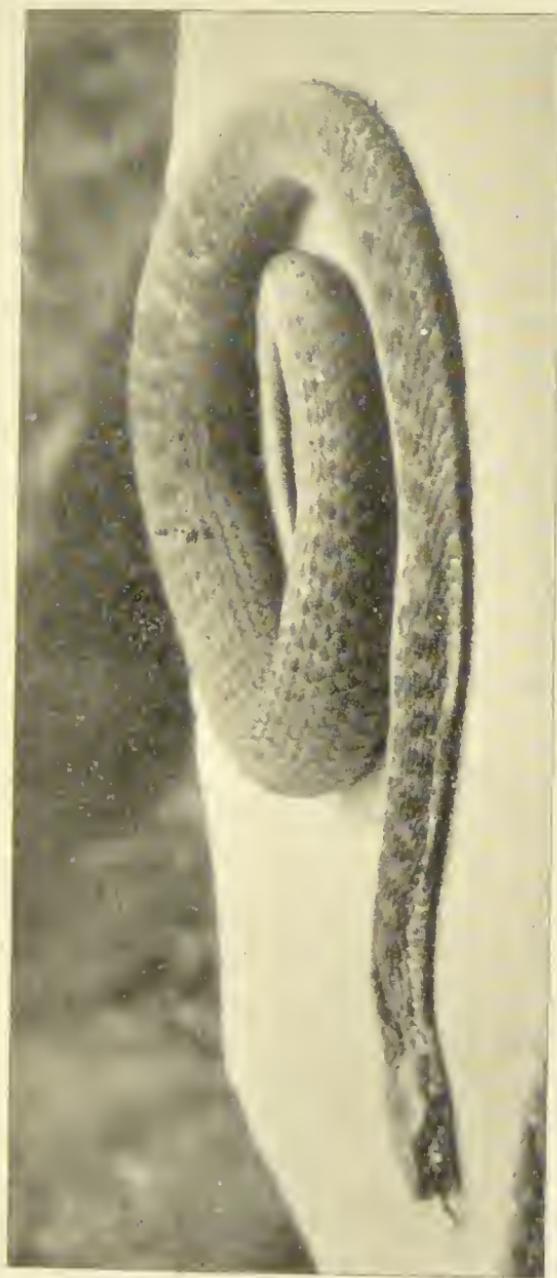


FIG. 32.—FEMALE ADDER IN YOUNG (OVIDUCTS FULL OF EMBRYOS).

uncurled, measured, and counted. The dissection must be made with some care to avoid injuring the eggs, and the following is the method I adopt myself.

Dissection of gravid female adders.—Fix the adder down on a board at the head end by means of a nail or drawing-pin through the snout, the adder being on its back, the belly exposed to the operator. Leave the body and tail free. The best instrument to use is an ordinary blunt-pointed surgical bistoury, which is a long thin-bladed knife with a blunt point. A sharp-pointed knife is very apt to injure the abdominal contents. Grasping the adder's tail with the left hand, insert the blunt point of the knife into the aperture of the cloaca (the posterior opening on the belly, that is) and gently slit up the belly from behind forwards, keeping the edge of the knife in a line with the edge of the successive large ventral scales. Continue this incision for about half-way up the body, and then withdrawing the knife, turn the separated surface of the belly over to the side where it is still attached. The whole of the contents of the lower half of the body cavity will now be exposed. Gently separate the intestines with the handle of the knife, and the two large strings of eggs will be seen lying underneath, one row on each side of the cavity. Trace these up and down to their ends, and tie a ligature round the oviduct at each end, on each side—four ligatures altogether. The blood-supply to the

eggs will be beautifully seen at this stage, and should be noticed before cutting out the eggs by dividing the oviduct on the distal side of each ligature. This done, the two oviducts full of eggs can be lifted out bodily on to a dish. When lifting out observe which is the right and which the left oviduct, as the number of eggs frequently differs on the two sides. If the dissection has been carefully done and nothing torn, the eggs on the dish will appear as shown in the illustration opposite, which is one of the series of dissections I made in investigating this question of the number of young.

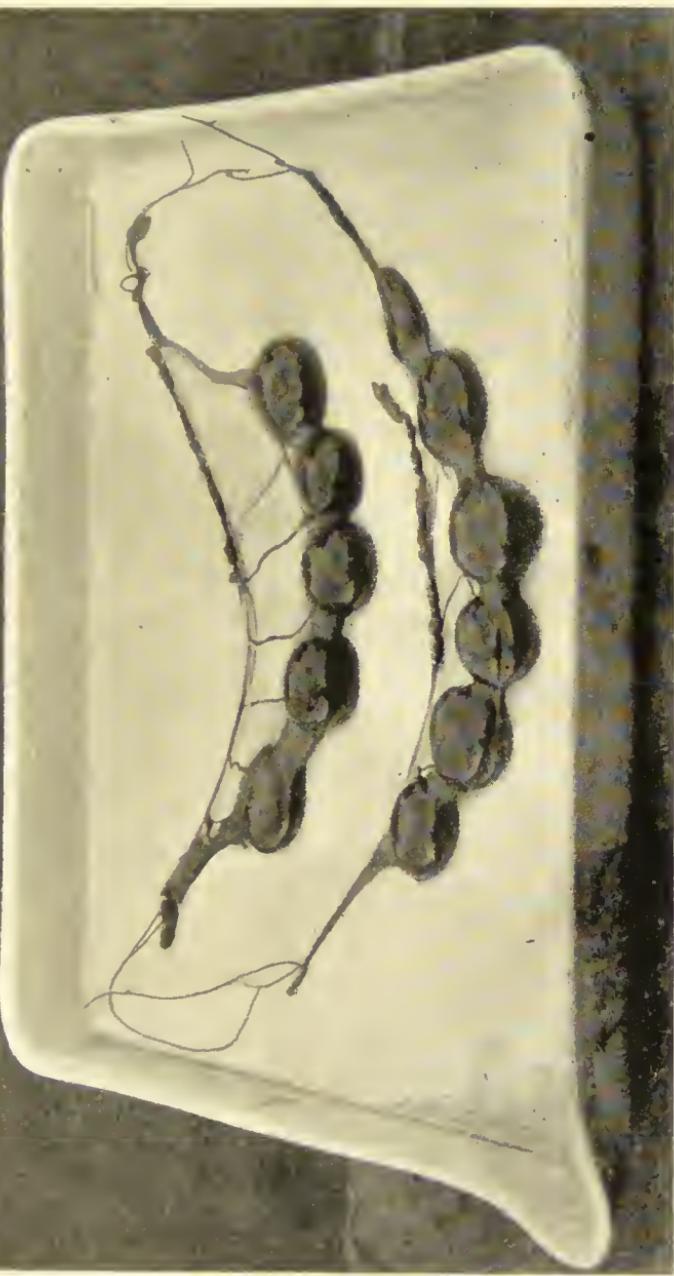
Result of series of dissections.—During the months of July and August in 1899 and 1900 I made 23 dissections of gravid female adders in the manner just described. The average number of young in that series works out at 13. I freely admit that a series of 230 dissections, instead of 23, might give a slightly different result, but should not anticipate any great divergence from the average given. The fewest found was in a specimen which contained 7, and the greatest number was 20, also in only one specimen. One or two contained 8 or 9, but the great majority were 10, 11, 12, 13, 14, or 15. I have found it the exception for an adder to contain more than 15 young or less than 10, and can hardly credit that as many as 40 could be carried to full time for reasons stated later. My conclusion may be subject to modification after a larger series of dissections ; but it is not a hasty esti-

Note—

Left oviduct containing 5 eggs (upper one).
Right oviduct containing 6 eggs (lower one).

FIG. 33.—DISSSECTION OF OVIDUCTS OF ADDER.

Blood-vessels. One artery to each egg.
Embryo adders curled up in eggs.



mate, but founded on the specific data stated, and it is that the *average number of young of the adder is about 13.*

Development.—The terms *viviparous* and *ovo-viviparous* are both used to describe the method of birth in adders. Both are correct: *viviparous*—in that it means that the young are brought forth *alive*; *ovo-viviparous*—in that the term means that the young are extruded *alive from an egg-covering*. The latter term is therefore more descriptive than the former, as it includes an additional fact.

It would be out of place in a work of this description to discuss microscopic appearances; but it is of interest to the field naturalist to observe the size and shape of the eggs and the embryos at different stages, and these may be briefly noticed.

Before the embryos can be distinguished in the egg, say in May, the eggs are long and somewhat the shape of a very short thick cigar. A specimen taken on May 16 showed the eggs the following size and shape.



FIG. 34.—EGGS OF ADDER.

On section, to the naked eye they appeared to be full of yolk. A month later, on June 14, a speci-

men showed the eggs to be larger and more *rounded*—thus:



FIG. 35.—EGGS OF ADDER.

The embryos were now quite distinct on opening an egg, over an inch long when uncurled, the head being prominent, and the eye the one dark spot in the general yellow colour of the embryo. Up to this time the female adder does not show much change in shape externally, but in another month the size of the belly is at once noticed. The embryos have now attained the length of $2\frac{1}{2}$ inches. The eyes are still most prominent, the mouth gapes, the body is about the thickness of a good-sized worm, and the wall of the belly is not closed in front in the middle line. Development after this is very rapid, and by the end of July great changes have occurred. I happened to get three on July 23, 1900, all extremely large ones, one of which is figured with a male taken at the same time, on p. 245. The female measured $26\frac{9}{16}$ inches. She contained ten embryos in seven eggs, which is a point not mentioned before; but it is not at all unusual to find an egg with two embryos in it. In this case the left oviduct had two eggs and the right oviduct five eggs in it. The eggs are now much

larger and quite round, the embryo being seen through the covering membrane lying on the egg surface. The embryos were $3\frac{1}{2}$ inches long, and, except in size, were much like those of July 10.

A dissection a fortnight later shows still more rapid progress, and by August 13 the embryos look like young adders for the first time. Even through the egg-membrane the markings could be distinguished, the egg being the one reproduced here. The embryos in this adder were again ten in number, and it was surprising on measuring them to find they were 5 inches in length. I photographed three of them, with a scale of inches marked on the dish (fig. 37), which gives a very good idea of the size and general appearance.

The anterior abdominal wall was now completely closed. The colour of the belly surface was still whitish, but the division where each scale was to appear was evident. The colour shaded off into grey on the back, and the markings were distinct, the zig-zag line and the extra line of patches opposite each point of the zigzag both quite plainly visible.

There is one very interesting detail in connection with the development of the markings which is seen at this stage. It is this. At the posterior part of the



FIG. 36.—EGG OF ADDER.

head, where subsequently the dark V-shaped mark is to appear, there is now a white V. That is to say, the pigment here has not yet been deposited, although the zigzag marking has been completed all along the back. I have since observed this in other embryos. The dark V seems the last mark to develop, as it is the most characteristic when developed. The

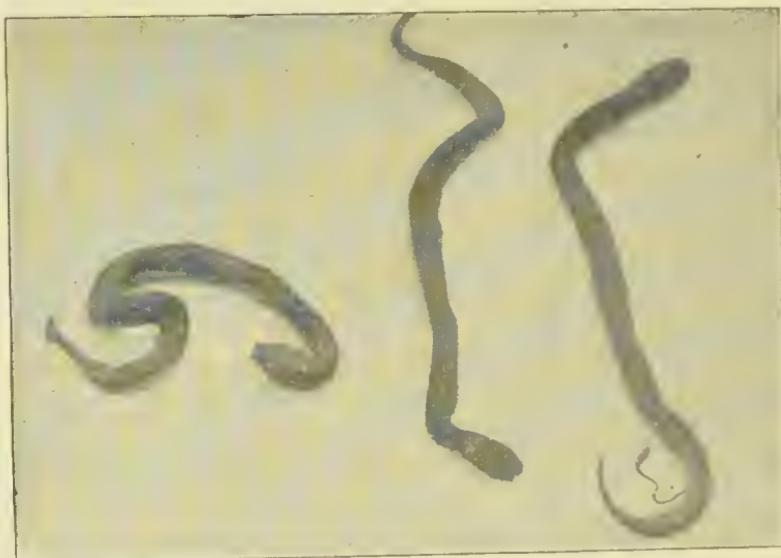


FIG. 37.—EMBRYO ADDERS.

white V is best seen in the middle embryo in the illustration last given. The allantois is seen in the embryo on the right.

Up to this time I had no difficulty in securing specimens to illustrate the adder's development; but towards the end of August the females begin to retire into secluded spots, as before mentioned, and were

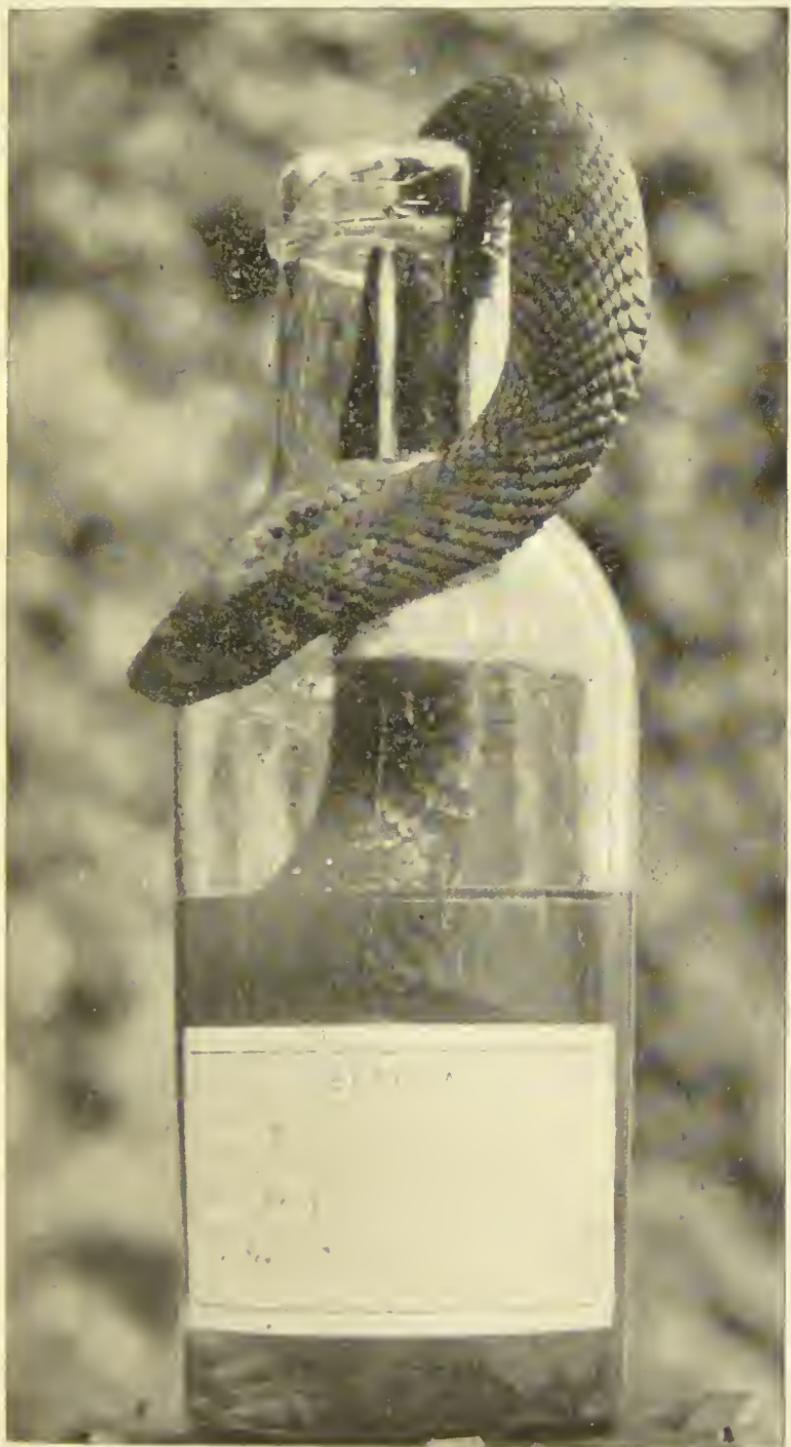


FIG. 38.—FEMALE ADDER (25½ inches).

hard to find. However, I was fortunate enough to capture on September 4, 1900, on the Graig Hill (North Monmouthshire), a female very big with young, and which proved a unique specimen as far as my

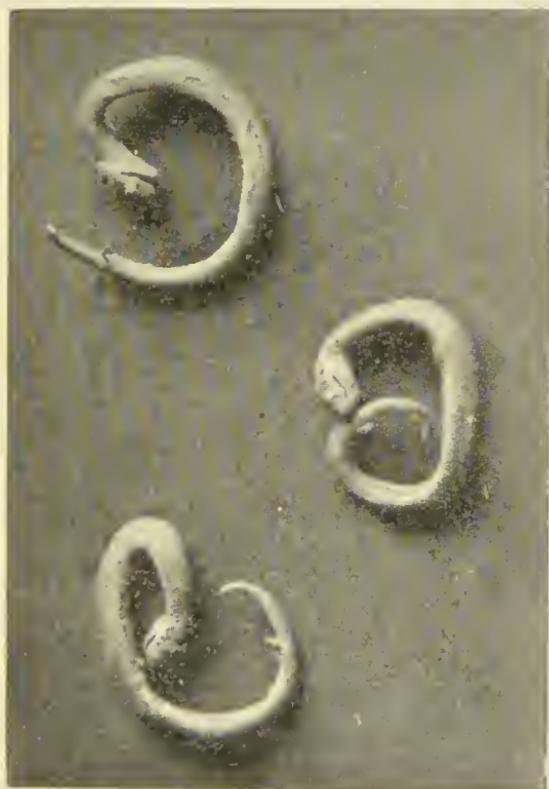


FIG. 39.—EMBRYO ADDERS.

(From the specimen in the Ellesmere Museum, kindly lent to the Author.)

collection is concerned. She was $25\frac{1}{2}$ inches long, and so heavy with young that she moved with difficulty, and was secured with the greatest ease. Her appearance in her museum jar is seen in the full-page illustration, p. 157. The young adders could be felt

through the abdominal wall, and it was evident that they must be about full time. After she had been photographed *in toto*, she was dissected with the greatest care in the way described. Opening the abdomen, about 1 inch from the anal orifice a young adder at once presented itself to view, loose in the cavity of the belly. Proceeding very slowly, two more appeared, also lying free and loose. These three were lifted out on to a dish, and the whole of the two oviducts with the eggs then exposed. These were tied and lifted out in the usual way. The eggs were counted and numbered eleven, each of which contained one embryo adder, making a total of fourteen for the whole litter.¹ But the size of the young was amazing. I measured the three loose ones first with great care, and found that they were 7, 7½, and 8 inches long respectively. The other eleven were simply covered with a very thin membrane (there was no yolk left in the eggs now), and were extracted and uncoiled. The whole fourteen were found to measure from 7 to 8 inches in length. They appeared perfectly formed, and no one would have taken them for unborn adders. I arranged ten of them on a dissecting-dish and photographed them, and to be on the safe side in case of any accident happening to the first negative, took a second view.

Of course the great interest of this specimen is that the young were just on the point of being born. In

¹ Three embryos had already ruptured their covering.



FIG. 40.—TEN EMBRYO ADDERS AT FULL TIME.

all probability another hour or so would have seen fourteen lively young adders playing about at that spot: they certainly have every appearance of being capable of looking after themselves. This group shows the fact that was mentioned when discussing sloughing—namely, that the first slough is cast before birth. Several of the embryos show the slough as a ring round the body, peeling off towards the tail.

It is quite possible that the size of the young in this particular case was larger than usual; but I think there can be no doubt that young adders are born greater in size than is usually supposed, and are quite perfectly developed at birth. All these embryos were provided with their teeth, including the fangs. Two of them are now in Sir William Turner's museum at Edinburgh University, the others preserved in my own collection, where any one interested can see them. This size of the young at birth will be again referred to when discussing the question of the adder-mother swallowing her young for protection.

CHAPTER XII.

THE ADDER—*Continued.*

SWALLOWING THE YOUNG FOR PROTECTION.

THEORY STATED—OBJECTIONS ADVANCED—EXAMINATION OF
VALIDITY OF OBJECTIONS.

THE next question for consideration is that bone of contention in adder politics—namely, whether the adder-mother does or does not swallow her family. There is a very widespread belief (found wherever adders occur) that the adder-mother will on the approach of danger take her young into some part of her interior by the act of swallowing, and will there retain them till such time as they can safely be ejected again to the exterior. It is astonishing what bitter disputes arise over the discussion of this matter; and I have heard two people holding opposite views on the righteousness of the Boer war argue *that* question politely, when on the conversation turning to the swallowing theory they became violently

abusive, and in a very few minutes were hardly on speaking terms. It is to be hoped that no such acrimonious feelings will be the result of this review of the question, but an honest endeavour made to re-think the whole subject in a serious and scientific manner, just as the student would approach any other question of natural science which has two sides to it, and evidence to be weighed on both sides. To be content to say off-hand that one cannot believe such an absurd idea is a very unscientific attitude to take up on this or any other debated point, especially when a moment's thought is given to the innumerable facts in nature quite as curious. Nor is it to be expected that scientists and others should believe it simply because a certain number of people say or think that they have seen the occurrence. In the absence of certain kinds of proof, which will be mentioned presently, it is a question entirely of weighing evidence, and the verdict may be that the swallowing of the young is (1) true, (2) untrue, or, as they say in Scotland, (3) not proven, according to the way in which the evidence strikes the particular jury who have the case under consideration.

This statement, then, being made, why is it not altogether accepted? What are the main reasons put forward as the objections to the probable truth of the statement? These objections may be stated as follows:—

1. That there is no adequate reason for its occurrence—*i.e.*, that the young would be safer outside the mother than inside her.
2. That there is not room for them in the supposed retreat.
3. That they would be killed by suffocation.
4. That no competent authority has ever dissected an adder and found the young in any position which would prove that they had been swallowed.
5. That those who believe that they have seen the process were deceived by something else taking place.

These several objections must be carefully examined.

1. *The swallowing process is unnecessary.*—Now it is important to carefully distinguish between matters of opinion and matters of fact in evidence. The opinions may be quite as important as a fact, but there can be many opinions while the fact remains. *This* objection to the swallowing theory is an *opinion*, a carefully considered opinion having due weight, that the young adders would be far safer if they each attempted to escape on their own account than they would be if the mother swallowed them. Those who hold this view are quite entitled to consider it as weighing against the truth of the theory. But it is quite as admissible to hold a different opinion on the safety of the young. It may be said that the question is not so much where the young would be

safest, but where the *instinct of the mother and the young themselves* points to as the safest place. It is, of course, a truism to say that most animal mothers make some effort to protect their offspring, quite apart from the efficacy of that effort. The mother's instinct is that the family are safer in her charge than when looking after themselves, and, as a rule, the young fall in with this view. It may or may not be the case that a dozen chickens would have a better chance of escaping a hawk by going in a dozen different directions; but the old hen does not think so, and prefers them under her wing, literally in this case.¹ I do not know definitely that young adders are the food of any other animals in this country,² but in other lands they are eaten by large birds of prey, and the adder-mother's instinct may remain even thus far west. This first objection is at any rate quite open to argument.

2. *There is not room for the young in the supposed retreat.*—It will be admitted that if the young are swallowed the receptacle must be the œsophagus or gullet. So that this objection may be stated in more definite words, thus: *that the cubie capacity of the gullet is not sufficient to hold all the young ones in a litter.*

¹ My friend the Rev. Maurice Bird says that a hen does call her chickens if in danger, but that they scatter.

² Many animals—*e.g.*, pheasants, owls, toads, pigs, &c.—are stated to swallow adders; but I have not been able to get actual demonstration of this in any case, so cannot speak from my own experience on the point.

This is a most pressing objection; for if it could be shown that the gullet of the adder is not capacious enough to contain the average number of young in an adder family, then there could be but little belief in the theory. Three factors are involved in this objection:—

- A.* The average number of young in a litter.
- B.* The structural adaptability of the gullet for swallowing.
- C.* The absolute cubic capacity of the gullet.

A. The question of the average number of the young has been discussed, and the conclusion stated that it is about thirteen. Here it is evident how important it is to have definite data to go upon. It is not sufficient to know that an adder could hold half-a-dozen young at a time in her gullet. If this is nature's method of protecting them, the conditions must be such as will apply universally. Not that a small female adder must be able to hold in her gullet the largest litter of young adders that has been recorded, but that an average-sized adder's gullet must be capable of holding an average-sized adder's family.

B. The question of the structural adaptability of the gullet to swallow the young may be dismissed with the remark that the gullet is adapted for swallowing very large articles of diet. This matter is also gone into in the consideration of adder anatomy, and presents no difficulty which can be said to apply to swallowing the young.

C. A reference to the chapter on the anatomy of the adder will recall what was there said on the size of the gullet (see p. 100). A careful comparison of the cubic capacity with the average number of young will show that the total bulk of the latter is not beyond the dimensions of the gullet. Discussing this question once with a naturalist, I dissected a gullet and distended it with a blowpipe in his presence. His comment was, "There is room in the gullet for twenty young, but for forty I think not." With this remark I am in full agreement, but am by no means satisfied that an adder ever had forty young at a birth, and am quite certain that if it did occur it was a most exceptional litter.¹ It is instructive in this connection to remember the appearance of the young in the egg just at full time, and to notice in what a wonderfully small space they can coil themselves up. When taken out of the egg it seems impossible that they should have been stowed away in such a small compass. So in the matter of the gullet it will be found by any one who cares to make a dissection such as described, that the cubic capacity is sufficient to hold the average number of young in the adder's family.

Anatomically considered, there is nothing impossible in the adder-mother being able to swallow her young and find room for them in the gullet.

3. The further objection is advanced, that even if

¹ I have been informed since writing the above that an adder brought forth forty young on one occasion in captivity.

the young could get into the gullet *they could not live there*. Of course it is not to be supposed that the young stay there indefinitely ; the presumption would be that they would be ejected as soon as the threatened danger was past, perhaps a matter of a few minutes. It is a well-established fact that some small animals have been taken alive out of a snake's gullet, as was mentioned in reference to their food. Moreover, there are cases of other reptiles having swallowed their young which are beyond dispute, notably the instance of the rattlesnake described by Dr Menger. So that the adder is not the only reptile that has the reputation of performing this curious action, only in the case of the rattlesnake it is established beyond doubt. Reptiles can do without a very good air-supply for some time, and the air naturally contained in the gullet after distension of the entrance would probably be sufficient to sustain the young for a short time.

It has been thought by some who do not deny the swallowing that this is an act of cannibalism on the part of the adder-mother, concerning which supposition Miss Hopley remarks : "The prey of snakes do not run helter-skelter a dozen at a time down the throat of an enemy ; nor do snakes when feeding gulp down a number of snakelings at once, but one at a time, and by the action of the jaws moving gradually over the prey."

4. The fact that no scientific naturalist has ever dissected a female adder with the *young in the gullet*

carries, perhaps, more weight with the incredulous than any other objection that has yet been mentioned, and rightly so. But even supposing the adder-swallowing theory to be true, it is by no means realised how extremely difficult a matter it is to get this kind of proof of it. In the first place, adders are not often seen at all, even if looked for in places they are known to frequent—that is, in comparison with the frequency of most of our animals. They will always move away quietly and quickly if they can ; and it is almost certain that unless the searcher happens to go within 3 or 4 feet of an adder, the reptile will slip away unnoticed. Still less common is it to see them with their young. Secondly, if it be true that the young are swallowed, this can only be supposed to occur when the family is in its infancy—that is, for some days or perhaps weeks after their birth. This would be, as a rule, towards the end of September, varying, of course, with the date of birth. As far as I have observed, the young do not remain with the adder-mother very long after birth, and it is a rare occurrence to meet the family all together. But if they are quite young when the adder-mother looks after them in this way, as they must be, the only chance of being able to witness the process is to come *across the whole family at a fairly definite and restricted period in any given year*. That being so, it is fair to ask, How many people in England and Scotland and Wales *see an adder at all* in any given week or two in the year ? Certainly very few. Of

those that do, a certain proportion would not stop to see what the adder was doing, much less about to do, but would leave that precise spot as quickly as possible. Of the rest, some would kill the reptile at once, but in the majority of instances the adder would elude observation. Supposing that one or two fortunate individuals waited to observe the adder, and were rewarded by seeing the young come to the mother and duly disappear down her throat, and that they then killed the adder-mother (a fairly extensive supposition), what would they do next? In nine cases out of ten the persons would be farmers or farm-labourers, or other persons working on the land, with other things to think about than proving the adder-swallowing theory, which they have probably believed in ever since they could walk. The adder-mother, killed, would be thrown into the nearest hedge, possibly after cutting her open and counting and smashing up the young. At any rate this is the answer I always get from farmers and woodmen who say they have seen it, that they left the adder where they killed it, never thinking that the editor of the 'Field' or any one else would be likely to give £5 to the person who brought the specimen to him. It simply strikes them as an occurrence that they have always known to happen: their fathers told them so, and at last they have seen it for themselves. That anybody should refuse to credit what they say on the matter is very surprising to them, and is accounted for by the ignorance of the

listener. That the foregoing reasoning is in no way exaggerated, I can testify from numbers of instances in my own experience. So that, whatever is thought about the truth or otherwise of the theory, it must be admitted that it is extremely difficult to get actual ocular demonstration.

5. If the adder-mother does not swallow her young, what has taken place to deceive so many people? It is supposed by some that the so-called cases of swallowing are really to be explained by people having killed the adder which was on the point of bringing forth, and that the young being *found in the body* in a fully developed state, were concluded to have been swallowed. It is quite likely that this is the explanation of some cases where the witnesses say that the young were *found swallowed* after the adder had been killed—where the actual swallowing has not been seen—as the large size of the young would deceive any one who had not seen a litter at full time. I have had an adder brought to me which was killed by a farmer by a blow from a stick, the result being that the young were protruding from the ruptured side of the belly. The farmer, who was not acquainted with the details of the adder's anatomy, thought that the young had been swallowed, whereas they had never been born. No doubt many cases are to be thus explained, but there are others where the actual act of swallowing is said to have been witnessed that do not come under this category.

On the whole, then, not having seen the act of swallowing the young, and having tried to survey in a spirit of impartiality the objections brought against the belief, what is the conclusion? Speaking for myself, I decline to come to a definite opinion. I have been told that such an attitude is simply begging the question. On the contrary, I maintain that it is the only scientific attitude one can take up on this or any other question, if the evidence seems to be inconclusive. Why should any one be expected to hold definite opinions on matters he considers unproved, even if they be possibly or probably true? I do not feel bound to form or express a definite opinion on the stability or otherwise of the Peruvian Government simply because I have two friends, one of whom thinks it the strongest that has existed for years, and the other is convinced that it is tottering to its foundations. I simply await events, in order to see which opinion turns out the correct one, keeping an open mind on the subject, and not refusing to weigh evidence whichever way it leads. Similarly in the adder-swallowing question, I do not refuse to believe it because I have not been fortunate enough to see it for myself (the combined evidence of the community has to be sufficient on many questions not coming under our individual notice), nor do I feel bound to accept every statement made by all sorts of people (or one would have many extraordinary beliefs). But it may be fairly asked, What would be considered

satisfactory proof? My answer is this. Let the first person who sees the adder-mother swallow her young proceed to carry out the following programme:—

1. Secure the mother alive or dead, and tie a ligature securely round the neck.
2. Take the specimen to any well-known naturalist, and make a statement in the presence of witnesses as to the circumstances attending the capture.
3. Request the naturalist to dissect the adder in the presence of three reputable witnesses.

The final act in the drama will be the finding (or not finding) of the young in the gullet of the adder-mother, or elsewhere, by the naturalist in question.

This is what science calls proving a question, and short of this, whatever private opinion may be held on the matter, scientists cannot be expected to consider the adder-swallowing belief proved. Until this is done, rather will they regard the question as one capable of proof, if true, but hitherto unsettled.

CHAPTER XIII.

THE ADDER—*Continued.*STATEMENTS BY CORRESPONDENTS ON THE SWALLOWING
OF THE YOUNG BY THE MOTHER.

HAVING now discussed the theoretical side of the adder-swallowing question, and come to the conclusion that anatomically and physiologically there is nothing impossible in the belief, it is of interest to see what practical men have to say on the matter. I have a large mass of correspondence in my possession on the point, all of which is most interesting, and from which all the following extracts are made. No comment is made on the letters as they are quoted, as it is difficult to do so without appearing, however unintentionally, to doubt the good faith of some of the writers, in some cases at all events. They should be judged in the light of what has been already learnt about the habits and structure of the adder, and especially in connection with the arguments considered in the last chapter.

In a paragraph in F. G. Aflalo's column "About Animals" in the 'Morning Leader' of 25th July 1900, he refers to a letter received from Mr Jacob of Eythorne, Dover. This was in reply to a suggestion by Aflalo that it would be well to have evidence on the point from reliable witnesses. Mr Aflalo sent Mr Jacob's letter on to me, and Mr Jacob and myself had a long correspondence on the matter. Mr Jacob has kindly given me permission to make any use I deem fit of his letters, and what follows is from the correspondence in question.

1. "In your [*i.e.*, Aflalo's] interesting article you appear to hint that the evidence of some reliable witnesses would be not altogether unwelcome.

"I can give you two instances from among my near acquaintance. My father-in-law is one instance and also a next-door neighbour is another—both in a large way of business as farmers, and both well known in the East Kent markets. Neither of these men was likely to be deceived, and equally also neither was likely to deceive in such a matter. Both have declared to me in conversation that they have distinctly witnessed the act of the young vipers being swallowed by the parent, and safely carried off by her. Neither knew the other had spoken to me on the subject, so there could have been no collusion.

"But what appears to me to be sufficient evidence of the fact is that I have seen it myself. That is to say, although *I have not actually witnessed the act of*

swallowing, I have nevertheless seen the young ones emerge from the parent's gullet, which to my mind is evidence that they had previously entered into it. It was in this way. Some twenty years ago in the month of October, in the early days of that month, I was shooting in a piece of viper-infested, very rough, broken ground in this neighbourhood, when, in a sudden dip a few yards in front of me, my dog, a high-eouraged retriever, all at once drew back a pace or two, and with the hair along his baek standing straight up, commenced baying some object which I couldn't then see over the slight rise in the ground. I immediately remarked to my son, who was with me, "There's something up!" and rushing forward saw, just over in the hollow, a viper faceing the dog. In an instant I took aim and blew the animal's head clean off close by the neek, when, to my amazement, seven young vipers immediately oozed out from the gullet. One of them had a solitary shot through the vertebra; the other six were perfectly sound, and wriggled about in a most lively fashion. They were, roughly speaking, *about the size of an ordinary lead-pencil.* What I should be pleased to know is, if vipers never swallow their young, how did these seven young ones find their way into the old one's gullet?

" My theory is, that my dog, springing suddenly forward over the bank, surprised the parent viper basking with her brood; then they for safety scuttled down her

throat, with the result I have described."—Eythorne
17th July 1900.

2. In reply to a criticism of Aflalo's, Mr Jacob writes:—

"First, you *assume* that my shot carried away not only the *head* but also the *upper part of the body*. This is absolutely incorrect. I was only 3 or 4 yards from the adder, and my shot *cut its head clean off* close to the neck. The body of the reptile was injured in no way. The young emerged from the *gullet*, and could not possibly have escaped from the *abdomen*, as the entire body was intact. If I had shot the adder asunder, I should have taken no more notice of the occurrence, but should have assumed as you do.

"Secondly, the young were *about 7 inches long*, and in the largest part of their body about $\frac{3}{8}$ of an inch in diameter. They were exceedingly active and lively, and had every appearance of knowing something of the world. *Would this correspond with the size and condition of previously unborn young?*

"I quite freely admit that if the case was as you suggest—viz., that my shot carried away the 'upper part of the body'—yours would be 'quite a plausible explanation,' but as the facts stand, I must ask you to allow me to join issue with you. I may say that during a shooting experience of nearly forty years I have twice shot an adder's head off whilst in the act

of facing my dog at close quarters, but in the other case I saw no young."—Eythorne, 23rd July 1900.

3. "A son of a late gardener to Lord Guildford (whose seat, 'Waldershare,' is close by here) was, when a boy, a sort of 'Thomas Edward' in a small way. He used to say that as he was proceeding to take a wasp's nest one autumn, he smashed a viper's head with a stone and a number of young ones emerged from the throat. To me it seems evident that it is practically impossible for a scientist to quit his study and say, 'I'll have a day in the country and find out for myself if vipers swallow their young,' with any great hope of success. The thing is not done to order. But one person here and another there once in a lifetime stumbles unexpectedly upon a case, and this after living and working all their lives in an adder-infested district, while by far the greater number, with equal advantages, are never in their whole lives equally favoured."—Eythorne, 26th July 1900.

4. "Since writing to you [the author] last I have met the under-keeper of Waldershare estate, and I asked if he had ever seen the adder swallow her young. He replied that he had, and that it occurred just outside his garden fence. He said he was going quickly round a corner by this fence when he came suddenly on a viper with three or four young ones about 6 inches long. They went down her throat, and

as he was quite unprepared, the parent got away in the nettles before he could secure her.

“Mr Merryfield, head gardener on the same estate, who has in his time acted as judge at most of the leading East Kent flower-shows, says that he once saw a viper’s *head crushed* on the road in front of him by a passing waggon. When he arrived on the spot several young vipers between 3 and 4 inches in length were escaping from the *neck*. He is positive that the body of the adder, apart from the head, was *perfectly uninjured*. He does not remember the date, but if you knew the man you would not hesitate to take his word. Mr Merryfield also says that the late wood-reve on the estate often used to affirm that he had also witnessed the act of swallowing. There are thus, with those I have mentioned in previous letters, four distinct cases on one estate, and probably inquiry would elicit more.

“The fact is, that among this class of people the occurrence is so generally recognised as to call for little comment, except perhaps to make a passing remark, and then little more is thought of it.”—Eythorne, 31st July 1900.

“P.S.—May I say by way of postscript? I had just finished this letter, and got it in the envelope but not sealed, when a friend called in, and having the subject on my mind, and knowing that he had lived all his life in a district where adders abounded, I

asked him, ‘Have you ever seen adders swallow their young?’ He replied, ‘No; but I know that they do so.’ I said, ‘Naturalists tell us they do not.’ He said, ‘My neighbour G—— told me distinctly that he had seen it, and I would believe him in the face of all the naturalists.’ He continued: ‘G—— told me that he had disturbed a viper with several young ones lying around it. When they saw him the old one opened her mouth, and the young ones wriggled down her throat. G—— disabled the viper, and putting his foot on the body, pressed it gently, when the whole of the young ones came wriggling *from her mouth*.’ Now, I am aware that this is only a sample of what dozens of men tell us. But when I consider the character of such men as this G—— (whom I knew well as a farmer and as a man above the average for intelligence and high character) and those I have mentioned before, I can only arrive at one of two conclusions. Either adders swallow their young or a considerable number of persons of high repute have banded themselves together into a conspiracy of falsehood. And this conspiracy appears to have been going on for generations, and to have spread over the entire country.

“I can’t help thinking that some of us poor country-folk are not quite the simple and credulous mortals we are sometimes represented to be. This is just a mild protest against the somewhat disdainful attitude of ‘scientific bigwigs’ towards such country-folk as myself and many others.”

5. "I just wish to say that three or four different persons, in describing to me what they have seen, have been unanimous in saying that the old one raised her *head slightly* (that would be just clear of the ground) and the young ones *jumped or sprang down the throat*. They tell me that the young did not glide down *on the level of the ground*. This striking unanimous and quite independent testimony seems to me to be somewhat significant. I may mention that my brother-in-law tells me he had a correspondence on this subject some years ago in 'Science Gossip,' in which he mentioned my viper-shooting experience. I don't know the year, and I never saw the correspondence."—Eythorne, 9th August 1900.

I owe many other very interesting letters on the habits of adders to Mr Jacob, some of which are quoted elsewhere, but these are the most important on the swallowing question. In the summer of 1900 I asked for information on the point from eye-witnesses, by means of a letter inserted in the press of Hereford and Monmouth, in both of which localities adders are common. In response to my appeal I received a large number of replies by letter, and other people made statements to me afterwards which I wrote down at the time. Some of these letters and statements I now append. The letters are quoted verbatim, the statements in the words used in writing them down at the time they were made.

Letter 1.—“I see you are seeking information through the local papers, asking, Do adders swallow their young? I think I can honestly say they do. I will write you an incident I once saw with an adder.

“I was walking by the side of a small brook and I came in contact with an adder. Of course the first thing I did was to kill it. To my surprise there were three small adders close by, from 3 to 4 inches long. I smashed them up and turned my attention to the old one, where I could see *protruding from the mouth* the tail of a little adder. I got it out; it was the same size as the other three. With the aid of two small sharp sticks I tore open the old adder and found two more of the same size inside. I should say the little ones all belonged to the same lot. This happened quite twenty years ago. I never saw such a thing before or since, though I have killed several since. I have killed two adders this season.”—James Davies, Mill Farm, Welsh Newton, nr. Monmouth, July 23, 1900.

Letter 2.—“I can quite understand your desire for information *re* adders. I came across one on Ascot Heath many years ago; it was attempting to cross the road, out of some furze and heather. I don’t know if it was not wanton mischief on my part to try and kill it—however, I made for it with my stick. It made a *hissing* noise, and, to my surprise, seven small—its own offspring, no doubt—ran to it and were de-

molished. This exceeded my comprehension. I succeeded in killing it, and from legendary remembrance I put one foot on its tail, and with the other I pushed up the body of the viper, and the *whole seven fled out*. I succeeded in killing four of these little ones; the others escaped in the heather. I am quite convinced they do swallow them, and I grieve I did not attempt the further elucidation to me a mystery."—E. Slann, 30 Queen Anne's Gate, London, July 2, 1900.

Letter 3.—“Seeing a few lines in the ‘Hereford Times’ of Saturday last about adders swallowing their young, I for one have seen it, and I will tell you where. It was not far from where you are living. About half a mile from Pontrilas station there is a farm called Penlan, just above the distillery works. Three hundred yards from the barn at that farm there used to be some rough brambles, just outside the Benath Wood. There was another person with me, but at present I have forgotten who it was. Anyhow, the old adder was a large one, very dark. I was very near putting my foot on her. She at once *jumped right at me*, and threw a lot of something out of her mouth on my clothes. I retreated back some paces to look for a stick or stone, and I returned back, and then she ‘blowed’ at me again. I saw two or three young ones go down her throat, about 4 or 5 inches long, and I noticed that they were very dark and about the size of a large worm. I was at that time

one of the under-keepers at Kentchurch Court for Colonel Scudamore. I killed the adder at the time. We saw one of the little ones come out of *her mouth*, and it got away in the brambles. The others we smashed to bits, with the old one. You can rely on this to be true."—John Went, 1 Park Crescent, Barry, nr. Cardiff, July 3, 1900.

Letter 4.—"I have had several proofs lately of *Pelias berus* swallowing the young on the approach of danger. Several years have elapsed since I saw a case myself. Lord Cawdor's woodman told me on Friday that on one occasion he saw an adder with a lot of young ones playing about her, but when they noticed him they crawled into her mouth. He killed her before she had time to swallow the last, which he found *in her mouth*. On opening the adder he found eight young ones, about $2\frac{1}{2}$ to 3 inches long. This was seen by an under-woodman as well. An educated lady told me a few days ago in Pemrokeshire that she had seen an adder deliberately swallow her young on her approach. A gentleman farmer saw the same thing, and on opening the adder found nine young ones, which had been *playing about her a few seconds before*."—(Rev.) D. H. Davies, the Vicarage, Cenarth, Caermarthenshire.

Letter 5.—"Seeing your letter in the 'Hereford Times' of June 30 about adders, I think it may

interest you to know that a year ago my late husband, Major J. M. Browne, was walking near The Wood, and he had in his hand a pitchfork with which he intended to remove some fagots. He caught sight of a group of adders, male, female, and *a number of young ones*. He made for them with the fork at once and disabled one. During this time the other old one was getting off, and the young ones had all disappeared, but he was in time to kill her. On smashing her with the fork, a number of young ones were inside her—I almost think he said *thirteen*."—(Mrs) Adelaide Clarenee Browne, Hall Court, Bishopsfrome, Worcester, July 10, 1900.

Letter 6.—"What I am about to describe happened certainly over thirty years ago, when I was quite a lad. The place was at Brockley Mount, on the estate of the late Sir R. Ryerott, near Sevenoaks, a place where many adders are found in hot seasons. The number of young was, I believe, nine; size about 6 to $6\frac{1}{2}$ inches long, $\frac{1}{4}$ inch in diameter. The adder was killed by a man named Pankhurst (I believe), long since passed away. The young ones were also killed as they were taken from the mother. I do not remember further details, as I was not particularly interested at the time, besides which, I had from my earliest childhood been taught the fact of the adder-mother swallowing her young under certain conditions. I am, however, certain of what I saw at the time stated.

Pankhurst was the keeper on the estate. There were several members of my own family and other friends together at the time of which I speak. Make whatever use you please of this."—(Rev.) Wm. Burnett,
The Manse, Eythorne, Dover, August 7, 1900.

Letter 7.—The following, taken from a communication I have received from Mdme. Elise Otté, is of peculiar interest, inasmuch as it is the only statement I know of from an eyewitness whose name is known to scientific naturalists. Years ago Mdme. Otté was well known for her work on marine zoology, and as a capable and accurate observer I take the following quotations from her narrative:—

"The scene which I witnessed thirty years ago, when I saw the young of an adder run into the mother's mouth, was on an occasion when I had come from Torquay to take part in a geological excursion to Lustleigh Cleve. The late William Pengelly, F.R.S., was to explain the nature of the strata exposed to view in some recently made cuttings of a railway. As, however, I had previously seen similar beds, I preferred to take the opportunity of reaching a point of view on the moor I specially wished to see. Accordingly I applied to the landlady of our inn for a guide to take me through the network of intersecting launes that had to be traversed. A young girl was selected to be my cicerone, and after innumerable turnings brought

me to the special group of granite boulders that I wanted to see. Descending, we turned sharply round a corner, where our steps were suddenly arrested, and we stood transfixed, half in admiration and half in terror. For there, not many feet distant, and exactly at the spot where we were to cross the lane, with its head slightly raised and facing us, lay basking in the sun a beautiful adder. As we looked we caught sight of six or seven little creatures at the rear of the mother's body, slipping and sliding about on the ground as if at play. Then suddenly, as if terrified, they separated, and with almost ludicrous rapidity shuffled along on either side of the mother's body till they reached the head, when, raising themselves a little, they tumbled on and over each other in their haste to reach her mouth, which almost as quickly closed over them."

The following have been made to me by word of mouth :—

Statement 1.—"Some years back I saw an adder killed and opened with thirteen young ones in her. We were reaping a field of beans. My brother was carrying the men's dinner up to the field; when on his way up he heard an adder hiss close to him, and a moment or two afterwards saw the brute a few feet off. It was a very large one—I should say nearly 30 inches long. We killed it and found it very full about the throat, and knowing that they

swallowed their young ones, we cut her open, and found, as *I say, thirteen young*, about the length of my little finger."—T. Morgan, Treseminy, Grosmont, Monmouthshire, June 1900.

Statement 2.—"A few years ago I disturbed an adder in a field near Dineterwood, Ewyas Harold. She gave a *repeated hissing noise*, so I knew there were young ones about, as they never hiss more than once unless they have young ones with them. The repeated hissing is to call the young. She then *put her lower jaw on the ground*, and I saw a number of young ones swallowed. I killed the adder, which measured 22 inches in length, and *found eleven young ones*, about $2\frac{1}{2}$ inches long, inside her."—Mr Prothero, gamekeeper, Pontrilas, Herefordshire, July 17, 1898.

Statement 3.—"Some years ago I was walking with my younger brother to help to gather the cut fern in Kentchurch Park. About a yard off the path I saw an adder coiled up in the grass in the sun. When I stopped 3 or 4 feet off she lifted up her head, put out her tongue, and hissed at us. I then saw six young ones, which I had not noticed before, wriggle up to her. She put her head *flat on the surface of the ground* and opened her mouth, when all six went in. The young were about $3\frac{1}{2}$ inches long. As soon as they were inside her, the mother at once disappeared

under a large stone. I could show you the exact spot on Garway Hill where this occurred.”—L. Davies, High Meadow, Kentchurch, Herefordshire, June 3, 1898.

I have many other statements of a similar character to these quoted, but no good purpose would be served by giving them all. I must, however, quote a letter from Tyrrell, the Keeper of the Reptile House at the Zoological Gardens, London, which F. G. Aflalo has kindly sent me. It runs as follows:—

“In answer to your question with regard to snakes swallowing their young, I am aware that it is a common opinion that snakes hide their young in this manner, but I candidly believe it never happened. I have had many kinds of vipers with young ones, and have tried several methods of frightening them, but have never seen the event take place, or any action to cause me to believe it even possible.”—J. Tyrrell, Reptile-Keeper, 27 Lawford Road, Kentish Town, July 12, 1900.

I have no intention of offering a detailed criticism on these statements: my readers can compare them for themselves, and form their own opinion upon their relative value. I would only add that the *italics* in this chapter are mine, and that they draw attention to what I consider the points to be particularly noted. Too much stress should not be laid on the very

various estimates of the size of the young, as they are not actual measurements (unless so stated), but the recollections of judgments of length formed some years before the letters were written or the statements made.

A word as to Tyrrell's experiments, which carry great weight in the opinion of some. To my mind they only prove that adders do not swallow their young in *captivity*, which personally I should never expect them to do even had I seen them do so in a state of nature, which I have not. Although reptile intelligence is by no means high, probably adders in a cage are quite conscious that they cannot carry their young away, and also that they are quite safe where they are, especially if the young have been born in the cage in question.

The late Mr Tootal Broadhurst published a pamphlet some years ago which he was in the habit of circulating among his acquaintances, in which he gave a list of people, with their statements, who had seen the swallowing process. The pamphlet was published by J. Maxwell & Sons, Dumfries, but I am informed by them that it is out of print. If I recollect rightly, Mr Broadhurst and his head-keeper were two of the witnesses, and statements were given from a dozen or so other persons.

Other references have been made to the matter from time to time in the 'Field,' 'Rod and Gun.' and other papers.

Lastly, it is of great interest to know that one species of venomous serpent certainly swallows her young ones, even if the British adder is not proved to do so. Dr Rudolph Menger, San Antonio, Texas, U.S.A., who has devoted much time to the study of the rattlesnake, describes the following incident:—

“I was one day passing through a field and happened to notice a large rattler lying along the fence surrounded by about a dozen very young rattlers. I dismounted, and while hunting for a strong stick with which to kill the snakes, I noticed that all the young snakes had disappeared, and that the throat of the old snake was considerably swollen. A few heavy blows killed the snake, and to my great surprise on examining the reptile’s neck, a large number of young rattlers crept out of the snake’s mouth. I captured one of the little fellows and found that, although it must have been very young, for it was scarcely a foot long, its poison-fangs were fully developed.”¹

¹ New York Herald, April 21, 1901.

CHAPTER XIV.

THE OPHIDIA IN THE MONNOW VALLEY.

AREA DEALT WITH — GEOGRAPHICAL — NATURE OF DISTRICT —
OPHIDIA FOUND — SIZE — EXPLANATION OF LOCAL DISTRIBUTION.

IT is proposed in this chapter to indicate briefly the results of the observations made on the serpents in the Mid - Monnow Valley. The lines of investigation followed up are those applicable to the study of our reptiles in other localities where they have a peculiar distribution, and the explanations offered for that peculiarity are such as may help to elucidate the same kind of problem in any particular locality.

The area dealt with.—These observations refer to that part of the Monnow Valley where the river Monnow forms the boundary between the two counties of Herefordshire and Monmouthshire, extending from Pontrilas railway station, on the Great Western line, to the village of Skenfrith, some six miles from the town of Monmouth. The distance between these two places is about eight miles, the valley running

from east to west, having Herefordshire on the north and Monmouthshire on the south bank of the river.

Nature of the district.—The traveller enters this part of the Monnow Valley by turning off the main road at Pontrilas sharply to the left if coming from the Hereford side, to the right if coming from the Abergavenny direction, and immediately finds the river flowing close by the road on his right. For three miles, till Kentchurch is reached, the road is fairly level, and at that point the steep sides of Garway Hill present themselves in front of him. From here he may get through the narrow five miles of the valley either on the Hereford side or the Monmouth side of the river; there being a bridge over the river at Kentchurch, and no other means of crossing till Skenfrith is reached at the exit from the valley. The change in the nature of the ground is startling in its suddenness. From the gentle undulations and well-cultivated farm-lands of the more central parts of Hereford, one is transformed, all in a moment, into a land of mountains and woods; and the cyclist who has chosen the road on the southern bank is compelled to push his steed up the steep approach to the village of Grosmont, and there rest and admire the magnificent view of the valley obtained from the high bank above the river, on which stand the ancient ruins of Grosmont Castle. Facing him here on his right is the Graig Hill, shelving sharply down to the river's edge, Garway Hill rising abruptly from the opposite side. To get out

of the valley one must go through it: on right and left the mountains shut the traveller in. Both hills are well wooded—with this difference, that while Garway Hill is only covered with fern and braeken on its upper third, the Graig is wooded thickly to its summit, and has a margin of cleared land at the river-side. It is necessary to note these features in order to understand how the fauna of this or any similar locality is affected by natural boundaries.

Ophidia found.—It so happened that it was winter when these observations commenced, so the reptiles were hibernating; and one could only proceed by making inquiries. This was done, making use of the class of people of most service for such a purpose —viz., gamekeepers, woodmen, farmers, and others whose occupations take them to the more secluded parts of the locality to be investigated. Their replies to my questions were carefully noted, and these replies showed a singular uniformity which very much struck me. I invariably got the answer, “There’s no *snakes* here, only *adders*,” or occasionally the reptiles were termed “vipers.” On further inquiry as to the usual size of the serpents these men were familiar with, a similar uniformity was observable in the estimates they gave of size. All agreed in putting the ordinary length of the only snake which they knew of at about “2 feet or a bit over.” Experience teaches that snake measurements which are only estimated are not always to be relied upon, and so it seemed that very probably

this one was exaggerated. It could hardly be believed that adders over 2 feet long were as common as this local snake evidently was, and no evidence could be obtained of there being more than one species found in the valley. There was nothing for it but to wait till the return of spring enabled me to get some specimens for myself, and in the mean time I became familiar with the spots where these reptiles were said to be most often seen. By the end of the summers of 1896 and 1897 I had caught and seen a considerable number of the local serpent, and found that it was, as my informants had assured me, the adder. But what about the length? Had they exaggerated it? To answer this question I cannot do better than give the exact measurements of the first six adders I took, because the same figures apply to many I have taken in the valley since, and also because the list includes both the largest and smallest adders in my local collection, and is representative of the whole extent of the valley.

		Length in inches.
No. 1.	Female adder caught near Pontrilas .	$26\frac{1}{2}$
No. 2.	" " near Skenfrith .	$23\frac{1}{2}$
No. 3.	" " near Grosmont .	$28\frac{1}{2}$
No. 4.	" " on Graig Hill .	23
No. 5.	Male " on Garway Hill	$21\frac{1}{2}$
No. 6.	" " near Pontrilas .	$19\frac{3}{4}$

A small calculation will show that the average of this series of six works out at a length of $23\frac{3}{4}$ inches, which is very nearly what my information

had stated. Of course this was not sufficient basis for a final conclusion, but it was sufficient to show that I was dealing with a locality in which the adder was the most common serpent found, and that it did attain a very large size here. The sixth adder in the list was a very young male, and evidently not mature. The female of $28\frac{1}{2}$ inches, taken within a few hundred yards of my own doors, is the largest adder I have ever captured, and one of the largest I can obtain authentic measurements of in any district. Since 1897 I have measured a large number of adders taken in this part of the Monnow Valley, and of the whole series (over a hundred specimens) I find that—

The adult male averages 24 inches.

" female " $25\frac{1}{4}$ "

If these figures are compared with the averages given under the heads of the various counties, it will be found that the adder in the Monnow Valley attains its maximum length for these isles.

Are there, then, no other snakes in this valley but adders? The gamekeepers, farmers, and others all told me that no other species was to be found, which of course meant that they had seen no other kind, and for two and a half years I never saw any other serpent here but the adder. Then on the 26th September 1898 I saw the small specimen of *Tropidonotus natrix* referred to in the chapter on that species, where the



FIG. 41.—FOUR MONNOW VALLEY ADDERS.

details of its capture are described. This is the only ring snake I have seen in the valley during five years, nor have I ever seen one nearer than four miles from the Graig Hill, on the slopes of the Hill towards Abergavenny, where they become somewhat common. *Coronella austriaca* (the smooth snake) I have never seen here at all, nor can I get any evidence of its existence.

Explanation of the ophidian distribution.—It is no uncommon thing to find that adders frequent certain restricted localities; and the interesting problem at once presents itself, Why should adders be so limited in their local distribution, and in particular, why should the adder alone of our ophidians be found in the Monnow Valley, and there attain such a large size?

The general principles governing the fact of the survival of a single species of any given class of animals in a restricted area are the same in all cases, and only require to be applied to the special local conditions of environment. Broadly speaking, those principles fall under one or other of the following heads:—

1. *Natural boundaries.*
2. *The chances of extermination or otherwise.*
3. *Food-supply.*

Applying these principles to this locality, how do they throw light on the fact that the ring snake is

absent, and the adder common and of large size in the Monnow Valley?

1. *Natural boundaries.*—In the case of a small inland area these are the topographical factors of rivers, mountains, woods, and cultivated land. The influence of such factors is at once evident in a case such as the one under consideration. This valley is approached from all directions through more or less cultivated parts, highly so in several directions, and is far more sparsely populated than the surrounding parts of the counties. The transition is sharp from arable or ploughed land to mountain and woodland. Obviously as civilisation advanced towards the valley from all sides, as the land became cleared and the plough succeeded the axe, the wilder animals, which shun the approach of man, would retire before him; and here at the northernmost point of Monmouthshire and the south border of Herefordshire, coming from both directions, these animals found a shelter in the secluded valley, and in the thick and extensive woods of Garway Hill and The Graig. To this day the latter hill is the home of the foxes in the district, and, as the Master and members of the Monmouthshire Hunt know only too well, it is a nearly hopeless task for men or hounds to turn an old fox out of his haunts in the thick woods on The Graig. So that from the point of view of natural boundaries, here is a place where one would expect the most retiring animals to congregate and make a last stand.

2. *The chances of extermination or survival.*—In the case of the adder civilisation is the worst enemy to be feared—man is the greatest danger. It may even be said that, excepting the severity of climatic conditions, the adder usually dies a natural death, unless at the hand of man. If, then, the adder has as its habitat a locality where man is chiefly conspicuous by his absence, the chances of survival are at their maximum. This condition is present in the Monnow Valley—that is, man is nearly absent. A few scattered farms, mostly rearing cattle and sheep, and therefore with fewer hands than a more corn-growing district, are all that are met with in the way of human habitations in a drive through this valley. The gamekeepers kill a considerable number of adders every spring (the woods on both Garway Hill and The Graig are heavily preserved with pheasants), but apart from this the adder population is very secure. This partly accounts for the exceptional size of adders here: they live to a good old age and attain their full growth. And when it is remembered that twenty female adders will in a season bring forth somewhere about 260 young ones, it is not hard to account for the fact of their being fairly common.

3. *Food-supply.*—This is an all-important question in the distribution of a species. It has been seen that the food of adders consisted mainly of mice, slow-worms, small birds and their eggs, newts, water-voles, and grubs. All these are in abundance in this valley,

especially the mice and slow-worms on the hillsides, and the water-voles at the river-side. These three are their staple articles of diet here. The bracken on Garway Hill, which covers a very large area, swarms with mice, which are also of course plentiful in the woods, while the slow-worm is perhaps more abundant across the river. The slopes of this hill are hot and dry and face the south—conditions which we saw were all characteristic of the taste of adders; so that altogether everything is in the adder's favour in the Monnow Valley. But there remains the problem of the entire absence of the ring snake. Without going over the same ground again, it is quite obvious that it is precisely because the conditions are so favourable to the adder that the ring snake is not equally attracted. In particular, the nature of the ground and the food-supply are not suited to its requirements. There are no small streams, few ponds, and therefore comparatively few frogs, the favourite food of the ring snake. Heaps of garden rubbish and manure are few and far between, and the slopes of the hillsides too exposed in winter for the eggs to survive if not hatched out in the autumn. The conditionsavouring the ring snake are better found on the southern slopes of The Graig some miles away, and accordingly there *Tropidonotus natrix* flourishes. It was suggested to me by a naturalist that possibly the adder had exterminated the ring snake here, but I have not been able to obtain any evidence to support

this theory ; and the fact that the adder is so often restricted to a particular locality in many counties, in addition to what we have seen to account for its presence here, leads rather to the conclusion that it is a case simply of a suitable environment.

The result of this investigation into the distribution of the Ophidia in the valley of the Monnow in its course on the South Herefordshire boundary may be summed up thus :—

1. That the adder (*Vipera berus*) is here relatively common.
2. That the average length is 24 inches in the adult male, $25\frac{1}{2}$ in the adult female — being much above the average of most localities.
3. That the ring snake (*Tropidonotus natrix*) is not found, except probably when artificially conveyed thither, and certainly does not breed there.
4. That the smooth snake does not occur.
5. The small red viper has been taken once (by the author), and seen on two other occasions.¹

Some such factors as the foregoing must be held to be mainly responsible for the striking ophidian characteristics of this and other localities which present similar peculiarities. There may, of course, be other modifying influences at work, which have either in past times contributed to, or even now are maintaining, the existing state of affairs.

¹ Cf. "The Reptilia of the Monnow Valley," Woolhope Club Transactions, 1898-99.—Author.

CHAPTER XV.

THE SMALL RED VIPER.

PLEA FOR ITS RECOGNITION AS A SPECIES—DISTRIBUTION—
DESCRIPTION—SIZE—VENOMOUS—SUGGESTED NAME.

THE small red viper is a reptile far better known to those whose occupations take them to the haunts of snakes than to scientific naturalists. Indeed by the latter its existence is generally ignored. Many works on natural history make no allusion to it, and where it is mentioned it is referred to as a variety of the common adder, or as merely the young of that species. Any departure from those views, if noticed at all, is sure to be severely criticised, if not resented as presumptuous. If, however, an observer is to be true to himself, he must record his observations, and is entitled to deduce conclusions therefrom irrespective of results. Careful study of British adders has driven me to regard the small red viper as a valid species, quite as distinct from the ordinary adder as a swallow is from a martin or a stoat from a weasel. It is a

reptile that has had but little attention paid to it, probably on account of its great rarity and its very local distribution, and also, no doubt, because it is very much more difficult to capture than the ordinary adder.

The small red viper resembles the common adder in the arrangement of its head-plates and in the number of belly-shields, and is therefore put in the same species. It differs from the adder in most other respects; but the differences, by an arbitrary arrangement, are not regarded as essential. These differences are, however, constant, which to my mind is an all-important point. It has been said that the small red viper is held to be either a variety of the adder or the young of the adder. The latter view is the important one from the point of view of its validity as a species. This opinion presumably is based upon the fact that certain ordinary adders exhibit a red colour. It is assumed that these adders, if they could have been examined when young, would have appeared to be small red vipers. But it so happens that this red colour in ordinary adders is characteristic of one sex only, and that the female. Thus in Mr Boulenger's most valuable paper on the "Variations of the Viper in Great Britain"¹ the following occurs: "Brown and brick-red specimens, with the markings of a more or less dark-brown, *are females.*" This is absolutely true, the colours men-

¹ *Zoologist*, March 1892.

tioned never being found in the ordinary male adder. The question therefore arises, Are all these so-called small red vipers simply young *female* adders? This could only be settled by obtaining specimens of this colour of both sexes. I had long believed in the distinctness of the small red viper from the adder, from its constancy in size and colour, but had never taken a male specimen until the 26th April 1901. I was at that time investigating the Ophidia of Central Dorset, and on the day mentioned took a specimen locally known as the little viper. It was the usual red colour, but a glance at the tail at once showed it to be a male. I demonstrated the male organs to the Rev. F. W. Brandreth, to whom I am indebted for the opportunity of examining that most snaky neighbourhood. The length of the specimen was $12\frac{1}{2}$ inches. This viper is well known in that locality, though of much less frequent occurrence than the ordinary adder, which is abundant. The male adder there is pale-grey with very black markings and bluish-black belly, not in the least like the small red viper.

Moreover, if the red viper were a young female adder, a large number of specimens ought to show the gradations of the one passing into the other. This is not seen in any of the hundreds of female adders I have examined.

Distribution.—On account of its infrequent occurrence, and the absence of authentic county records, it

is a matter of some considerable difficulty to determine its exact distribution. F. G. Aflalo¹ mentions that it is found in Herts, Somerset, and Devon, also in parts of Scotland, and these three counties are usually the ones mentioned in this connection. He also refers to the capture of "a small red kind" in Fairlight Glen, near Hastings, in further reference to which he writes to me :—

"I wish I could give you the accurate information you seek touching those Fairlight red adders, which I distinctly remember killing on two or three occasions, some twenty years ago. But I did not in those days—it must have been during the period 1881-1883, during which I lived at Hastings—see any particular interest in a snake beyond its power of dying picturesquely, and all I can recall is the *decided reddish hue* of some of the adders (*not all, mind*) that we found thereabouts, and the belief among the villagers in the neighbourhood of Fairlight and Ecclesbourne that these red adders were more dangerous than those of normal colour. More than this memory does not spare me."

The Rev. H. A. Maepherson, in his 'Fauna of Lakeland,' records the occurrence of a specimen thus :—

"Most of the Lakeland vipers are grey or brown in ground colour, regardless of their sex. The only instance at present known to me of the capture of a 'red' individual within our limits relates to a viper

¹ Natural History (Vertebrates) of the British Islands, p. 304.

which Joseph Boadle presented to the Whitehaven Museum. ‘Instead of being grey and black, it is a dull ferruginous red, and the zigzag markings are a dark mahogany colour.’ This animal had been caught near Rig House, Dcan, West Cumberland” (recorded in the ‘Whitehaven Times,’ December 3, 1874).¹

But as a matter of fact, the distribution of the small red viper is much wider in England than has hitherto been recognised, and not the least interesting of the results of my effort to obtain a complete account of the *county* distribution of our serpents has been the discovery that this species is to be found in at least fifteen English counties, five of which have already been mentioned. I have myself observed it twice in Herefordshire, both times in the same locality—namely, on Garway Hill, once in 1898 and once in 1900. I have also taken one specimen in Monmouthshire, on August 1, 1900; this latter specimen measured $9\frac{3}{4}$ inches, and was captured on the summit of the Graig Hill. I showed it at the annual meeting of the Woolhope Field Naturalists’ Club in 1900. I have also taken one—a male—in Central Dorset (Buckland Newton) as mentioned. A reference to the county reports in this book will show that it also occurs in the following additional counties: Berkshire, Oxfordshire, Lincolnshire, West Sussex, Northumberland, Durham, Dorset, Devon. In most

¹ From this description the specimen might have been a female adder, the size not being given, nor the sex.

cases, however, it is an unusual occurrence, and though its distribution is a fairly wide one, its numbers seem to be small. No doubt a further investigation will establish its occurrence in some other counties.

Description.—The name small red viper is sufficiently descriptive, as the serpent is both small, red, and a viper. It can be at once distinguished by its red, coppery, or ferruginous colour, which is the only colour it shows, the markings being a darker shade of the same colour. The zigzag back-line and the V-shaped head-mark are both present in the same positions as in the adder, but the extra side-line of black or brown patches seen in the latter have been absent in the specimens of small red vipers I have examined. There is

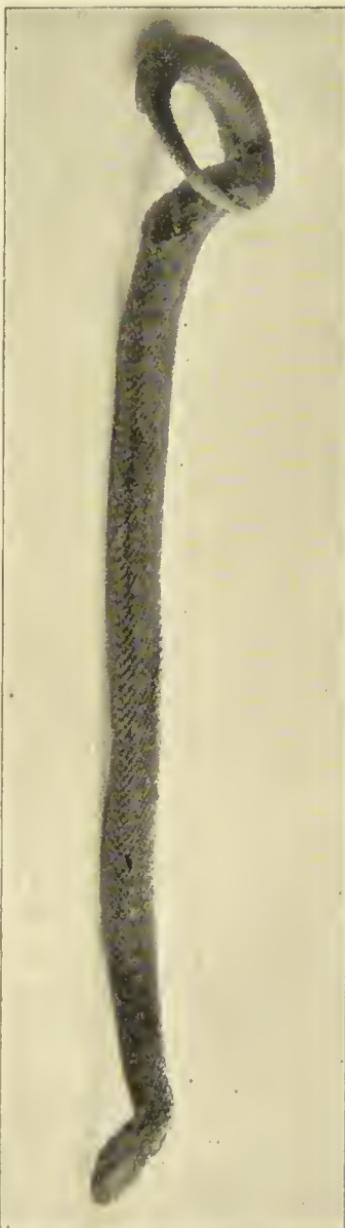


FIG. 42.—SMALL RED VIPER.

not the amount of colour variation we saw in the adder, the only variation being in shade, from bright copper colour to a darker mahogany shade. The tail is very sharply marked off from the body in females, and ends in a very fine point.

Size.—If the colour of this species is distinctive, the size is no less so. As in the adder, the average length varies somewhat in different localities, but *the largest small red viper* is hardly the length of the smallest adult adder. The adult adder averages from 18 to 25 inches; the small red viper averages from 10 to 15 inches in length. The most common measurement is about 12 inches. This is of some practical importance, as only last year my attention was drawn to a statement in some newspaper correspondence, where a writer informed his readers that they need never be afraid of the larger snakes in this country, as our sole venomous serpent was only about 10 inches long. It turned out that his experience had been gained in a part of Devonshire where the small red viper occurred, and this was the only kind he was familiar with. I mention this because it is a proof of my contention for the validity of the species.

Venomous, &c.—In places where the small red viper is found it is regarded as being particularly venomous, and more to be feared than the ordinary adder. Whether this is really so or not I cannot say, but there is no doubt that it is more pugnacious and less timid. On being disturbed it does not seem to

make every effort to glide quietly away, as does the adder, but, curling its tail in a circle on the ground, erects its head and hisses vigorously.

Much requires to be learnt regarding its food and reproduction, the great difficulty being to secure enough specimens to form reliable data.

The illustration of the small red viper (p. 211) is from the one I captured in Monmouthshire.

Specific name.—If naturalists could see their way to use some specific name, such as *Vipera rubra*, when referring to this viper, it would greatly conduce to accuracy and clearness, and would avoid the confusion which at present exists.

CHAPTER XVI.

CANKER IN SNAKES KEPT IN CAPTIVITY.

SNAKES kept in captivity usually remain free from any disease if proper attention is paid to the selection of the diet and scrupulous care taken in the cleansing of their quarters. But in spite of the greatest care, it sometimes happens that a curious condition of the mouth, eyes, and head and neck appears and generally proves fatal. This disease is called "canker." An excellent account of it was sent to me by Mr B. J. Horton of Birmingham, who had a remarkable series of cases of the disease in his own serpents. Mr Horton in his description says:—

"Canker is thought to be a form of tuberculosis, and, as far as I know, there is no cure for it, although a friend of mine, who has had considerable experience in keeping snakes, says that a snake so affected may recover if kept warm. This, I think, is doubtful. I cannot give any reason for an outbreak of this disease except the drinking-water which is supplied to the snakes. I always used to give my snakes hard unfiltered water, and during two years I lost nine snakes

out of twenty I had from this complaint. I was then advised to substitute soft filtered water for the hard unfiltered. This I did, and for three years I have not lost a single specimen from this cause. From this I think there is reason to connect the water with the canker. Strange to say, the disease does not occur in snakes in their wild state.

"The symptoms, taken from the examples which I have had in my own collection, are as follows:—

"The mouth of the snake generally seems to get filled up to a greater or less extent with a kind of fleshy substance. The eyes frequently increase in size, and sometimes turn quite white and opaque, though this latter symptom is rather exceptional. Then gradually the head and neck swell up, sometimes to such an extent that the scales become stretched apart. The snake in the mean time refuses to eat or drink. There is no outward sign of any other part of the snake being affected except the head and neck. The reptile may linger in this condition for a considerable time, although most of my specimens that were affected have died in two or three weeks.

"The disease is highly contagious, in proof of which I may cite the following cases. I received a perfectly healthy specimen of the dice snake (*Tropidonotus tessellatus*), which I placed in a new vivarium which had only just been made, and consequently had never previously contained snakes. The dice snake remained in a healthy condition for two or three weeks, when I

noticed it was slightly affected with canker. It got rapidly worse, and died two or three weeks afterwards. I then cleaned out the vivarium with soap-and-water, and the next specimen I placed therein was a small specimen of the viperine snake (*Tropidonotus tigrinus*). This snake was also quite healthy. About five weeks subsequently this snake became affected with the disease, and after lingering for eight or nine weeks, died. This time I scrubbed out the vivarium with hot soda-and-water, and put in the vivarium a specimen of the English ring snake (*Tropidonotus natrix*), which showed sign of canker a week afterwards. In this case the symptoms were very severe, the eyes becoming quite white and opaque, and the head very much enlarged in size. Death took place in a few days. I did not use that vivarium again for about six months, and then I enamelled it inside and out, and have not had the misfortune to lose any specimens since."

From this most interesting series of cases of canker it seems very evident that a serpent once infected with the disease may leave the germs in the cage or vivarium it has been inhabiting, and I should strongly advise any one who loses a snake from canker to have the cage thoroughly disinfected with a strong solution of carbolic acid, repeating the washing at intervals of three days until it has been done three or four times.¹

¹ Mr Horton has sent me a leopard snake which was supposed to have died of canker. After careful examination, no sign of tuberculosis could be found, only inflammatory changes being present.

CHAPTER XVII.

EXAMINATION AND RECORDING OF SPECIMENS.

EVERY field naturalist who wishes to make his observations of permanent value, or to record them in the transactions of a society, should keep careful notes of all specimens examined. A definite scheme ought to be adopted for each species or class, and the following is the method advocated for keeping records of serpents. The figures are taken from the record of the most recent adder in my collection.

Species.—*Vipera berus*, common adder.

Date of capture.—March 15, 1901.

Locality.—Norton, Skenfrith, Monmouthshire.

Sex.—Female. (This is determined by the tail being sharply marked off from the body, and its shortness; the general colouring, the throat colour, the belly colour, and number of shields.)

Total length.— $25\frac{1}{2}$ inches. (Note whether above or below the average for the particular locality.)

Length of tail.— $2\frac{1}{2}$ inches.

Head-plates.—Show the normal arrangement. (Note the size of the parietals and their relation to the

frontal. The number of small shields in front of the frontal. The arrangement and number, if any, of the small shields between the frontal and the supra-ocular.)

Lip-scales, or labials.—Nine on the right side, eight on the left side, the fifth and sixth being fused on the left. (The labials vary greatly, and should always be noted.)

Shields round eyes.—Ten in number.

Body scaling.—Ventral shields number 144. Sub-caudal shields number 32 pairs, and the terminal conical shield.

Colouration.—This specimen exhibits the usual female colouring in this locality: brown markings on an olive-green body, mottled belly, yellowish-white throat, and bright orange colour on the under surface of the tail.

On dissection.—(If dissected note the contents of the stomach, and the stage of development of young if a pregnant female, also the number of eggs developing.)

Record of specimen.—Private collection, No. 4, year 1901, preserved in formalin solution. (Specimens may be preserved in various ways. Methylated spirit is frequently used, but is not very satisfactory: the specimens shrink considerably in it after a time, and the colours become dull. Absolute alcohol exhibits them best, but is expensive if used on a large scale. Formalin is not a good preservative for snakes, though it is comparatively cheap.¹ Serpents should always be preserved in fluid, never stuffed, as they never look natural in this latter way.)

¹ Formalin is apt to turn snakes blackish.

The preservation and recording of British serpents by field naturalists on the above plan would very soon result in the collection of a vast amount of information at present unobtainable. Most naturalist societies have museums connected with them where the specimens may be deposited, and if not, the curators of county museums would be only too glad to have representative collections of local reptiles. The great drawback of specimens killed by keepers and workmen, as a rule, is that they are so smashed as to be useless for preserving. The usual method of killing an adder is by means of the nearest stick that is stout enough for the purpose; but the field naturalist will find it much more satisfactory to use a tool made expressly for the purpose, and which costs very little.¹ It is a long-handled pair of forceps, the blades of the instrument being covered with indiarubber, so that the skin of the reptile is absolutely unharmed. The blades close automatically, so that the adder cannot get away even if the instrument be dropped. The advantage of such a tool is that harmless snakes may be picked up and examined by those who do not care to do so with their hands, and the snake set at liberty afterwards unharmed; or if a venomous species be captured, it can be disposed of carefully without injuring it for preservation.

¹ This instrument was made from my instructions by Messrs Watkins & Doncaster, London, and answers its purpose admirably.

CHAPTER XVIII.

VARIOUS INCIDENTS RECORDED OF BRITISH SERPENTS.

Snakes and water.—“One sometimes hears people talk of an English water snake, but of course they really are referring to *Tropidonotus natrix*. The ring snake takes kindly to water, as the following incidents will show. They are led there primarily by a desire to find suitable food. So it is when Dante wants to describe the souls huddling together (in the ninth canto of the ‘Inferno’) he says:—

‘Even as the frogs before the hostile snake
Across the water scatter all abroad,
Until each one is huddled on the earth.’

I fancy that this ‘biscia’ which Dante saw in the swamps round Ravenna was merely a ring snake looking for her dinner. Gilbert White mentions them actually lying under water in search of prey, but I have never seen this.

“Beyond the desire of feeding, snakes take to the water for mere enjoyment. I have often seen them

swimming across a pond. Once, up at Heath Pool, when accompanied by a black retriever, I saw a snake swimming and threw my stick at it. It went some distance beyond the snake, and the dog plunged into the water to fetch back the stick. *En route* he came across the snake, which stiffened itself as the dog approached. The latter, mistaking the snake for the stick, snapped at it, and then shook its head in disgust. I think he must have killed the reptile, for it did not reappear."—J. Bevir, M.A., Wellington College.

Adder-springing.—"I was never faced by an adder, neither has one ever attempted to spring at me, although I have killed several. One of my workmen told me one sprang at him as high as his waist, but he managed to dodge it, and it just missed him. A keeper tells me he once struck at an adder, which had just previously killed a favourite dog, and the blow missed, and the reptile arched itself up, resting on its tail and neck only, apparently about to spring at him. He cut it down, however, before it did so.

"I have twice had an adder face my dog, but on each occasion I shot the reptile's head off. Twice in my experience I have had an adder in my house in the winter, when living in a farmhouse. We supposed them to have been brought in with the firewood. They were somewhat torpid, and easily killed.

"A neighbour who lives by tells me that he was riding a bicycle last summer through Dane Court grounds when he saw an adder crossing the road in front of him, and thinking he could break its back by riding over it, he steered straight for it, when just as he thought he had got it, the adder suddenly reared itself up on its tail, and he missed it in consequence. The adder's head was raised up quite close to the calf of his leg as he rode by."—W. Jacob, Eythorne, Dover.

What the Archbishop saw.—"Even the closest observers of snakes are apt at times to be mistaken. For instance, I find in the Life of the late Archbishop of Canterbury (vol. i. p. 22) that on one occasion 'he was returning alone from the village, and in the dust of the road, on the bridge which crossed the stream, he saw a thing which looked like a snake, with objects like small wheels on its head, that were running round and round at a furious rate, so that the dust flew up in clouds. He was much too frightened to examine it, but ran home and told his mother. He was sent to substantiate his story—to look for the object and bring it home; but it was gone, and he was whipped for telling a lie. "Yet I can see it still," he used to say, "as it lay there;"' and in later life I have met with few people who knew more about the natural history of Berkshire than he did."—J. L. Bevir, M.A., letter to the 'Outlook,' November 10, 1900.



FIG. 43.—“BRUSHER MILLS,” THE FAMOUS SNAKE-CATCHER.

"Brusher Mills."—“During the time we lived in the New Forest I was acquainted with the old snake-killer ‘Brusher,’ whom I met one day when out walking. He was carrying his pouches full of writhing snakes. I asked him if he had found many adders, and said I should like to see him catch one, and told him I would help him to find one. We strolled to a likely spot, but ‘Brusher’ found the adder, and quickly whipping out his tongs, seized it near the head. ‘Now, marm,’ said he, ‘would you like to see its teeth?’ ‘Oh yes,’ said I, and with the help of other tweezers he made the poor creature open its mouth wide, and I had a fine view.

“I said that I had heard that he made oil from adders that would cure their bite, whereupon he pulled out a bottle of clear oil from his pocket, and showed me the dreadful bites on his own hands he had cured with the oil. I asked him how he got the oil, and with a grin he said that he baked the adders in an oven, in a large jar. ‘Please, marm,’ said he, ‘would you like to see this one have a run and me catch it again?’ !!! But this was more than I had nerve for, and leaving the old man a small present, I made off as fast as I could.”—Adelaide Clarence Browne, Hall Court, Bishopsfrome, Worcester.

Adders and spiders.—“A young lady told me the other day that she once saw a large adder in the garden. She called the servant, who said, ‘Wait

till I get a spider, miss, and if I can get it to crawl over the adder, it [i.e., the adder] will get so angry that it will burst to bits directly.' However, the spider was obstinate, and refused to perform. The idea, it seems, is quite general in some of the districts about here."—Frank Davies, Newcastle Emlyn, South Wales.

Pigs eating adders.—It is said that the farmers near Clun Forest, Shropshire, when the adders became too numerous to be pleasant, used to turn out their pigs, which made short work of the adders by feeding on them. I have not been able to authenticate this from eyewitnesses, though I have been told that the farmers did adopt this curious plan.

The idea is by no means novel, for Darwin in his 'Expressions of the Emotions' states that "it is well known that pigs are employed in the United States to clear districts infested with rattlesnakes, which they do most effectually." Dr R. Brown also stated in the Proceedings of the Zoological Society (1871) that pigs will always make a rush for snakes whenever they see them, and that snakes would always make every effort to get away from the locality of a pig.

I know myself of an instance where Tamworth pigs were imported into a district in South Africa with the idea of ridding a certain spot of the numerous snakes which infested it, and I understand that not only was

the experiment successful, but the pigs eventually multiplied and provided most excellent sport.

Mr Edwin Gosling (East Grinstead) tells me of an incident which further illustrates this weakness of pigs for serpents. He once came across a large serpent in Llangwyfan Bog (Wales) asleep on some water-weeds. The reptile was between 5 and 6 feet long, and was evidently a foreign serpent which had escaped from a collection, or been washed ashore from a wreck, or in some other way got out of its natural latitude. He killed the serpent, and on opening it found a large brown rat in the stomach. He left the snake where he killed it, intending to pick it up on his return and have it identified at South Kensington. However, a short time afterwards, on returning from the shore of the bay, he found that a pig had just finished devouring the serpent.—The Author.

Snakes in trees.—“I once saw a beautiful specimen of the ring snake, just fresh from casting its slough, coiled up on the branches and leaves of a hazel-bush, about 4 feet from the ground, basking in the sun, and probably on the watch for a small bird. The bright colours of the snake on the background of the green leaves formed a most charming picture. Mr E. Blagg tells me that it took so much strength to pull one of these snakes out of a loose stone wall in which it had taken refuge that he was afraid it might be pulled in two.” (The tail, no doubt, was

curled round some projecting point, and was being used as a means of prehension—much as a conger eel will do in a hole in the rocks.—Author.)—John R. B. Masefield, Cheadle, Staffordshire.

Retrieving a snake.—“A ring snake was once seen as late as October (by Mr E. Blagg) swimming across a pool near Cheadle. His retriever dog went after it and seized it by the neck, the head only being above the water. It then coiled up and the dog loosed it, but again seized it (quite tenderly) and brought it to his master.”—John R. B. Masefield, Cheadle, Staffordshire.

Frog croaking though swallowed.—“I had a small ring snake, about 20 inches long, this year (1900), which was kept in the same case as a very large specimen, and one day I put a full-grown frog in the case, intending it for the large snake. The smaller one, however, immediately seized the frog, and after some difficulty swallowed it. I distinctly heard the frog croak *in the snake* several minutes after it had been swallowed. In a quarter of an hour or so the frog was disgorged all but the head, which was retained in the snake’s mouth. The frog was still alive, and did its best to free itself from its unpleasant predicament, but without success, and the snake began to swallow it again. This process took about half an hour to accomplish, and in another

half hour (after the frog had been swallowed for the second time) I could still hear it give a faint croak."

—B. J. Horton, Sparkbrook, Birmingham.

Ring snake in a stone.—A most curious snake incident was related to me by the Rev. F. W. Brandreth of Buckland Newton, Dorset. Some five years

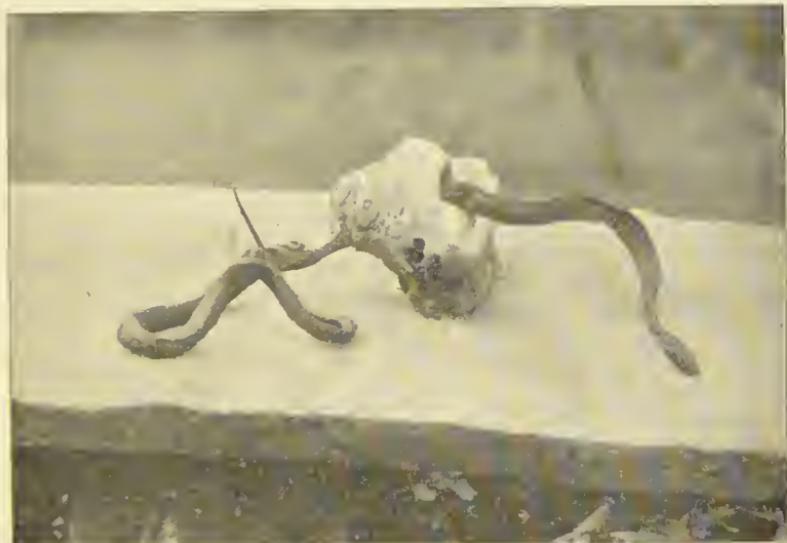


FIG. 14.—RING SNAKE IN A STONE.

This illustration represents the condition of affairs found by the keeper. This is not the actual specimen, but a flint I found in the same locality (where they abound), and which the keeper assured me was identical in appearance with the original one. I inserted a ring snake through the hole in the flint, to show the result, as he found it.

ago (*i.e.*, in 1895) his keeper found a ring snake embedded in a flint stone, from which it could not possibly escape. The stone had a hole in the centre, and the body of the snake was protruding from either

side of the stone, like the two halves of the axle of a wheelbarrow. The snake was about 15 inches long, and was quite fixed in the stone, which was a flint. The reptile was thin in the middle and bigger at both ends on either side of the stone, and those who saw it consider that it must have grown for some time in this extraordinary position. The flint had to be broken in half before the snake could be released.

I can only account for the reptile being caught in this way by supposing that it attempted to get through the hole in the stone at a time when its stomach was bulging from some food, that it was wedged in firmly where its girth was largest, and being unable to move either forwards or backwards, had so remained fixed. The organs on either side of the point of constriction would soon swell out and render all efforts at escape quite futile.

Adder with two heads.—The Rev. Canon Bush. Duloe Rectory, Cornwall, has sent me a very interesting note on an adder killed in 1853 (or 1854) which had two heads. The adder was brought to him by a labourer, who had found it in a wood in the neighbouring parish of St Martin. The reptile was about a foot long, and was shaped like the letter Y, the two limbs of the Y representing the division of the reptile into two heads. My correspondent noticed that each head had independent action, and that when the adder opened one mouth the other mouth did not necessarily

follow suit. The curiosity was at once packed up and sent alive to the Zoological Gardens, a journey which in those days occupied considerably more than the seven hours now sufficient to do the distance. Although the adder reached its destination alive, it died soon afterwards.

This is not the place for an abstruse embryological dissertation to account for the monstrosity, but it is probably not unconnected with the fact that I drew attention to in the chapter on the development of the adder—namely, that frequently one finds two embryo adders in one egg. Where such is the case, an accidental fusion of the early developing cells might account for the production of a double-headed adder.

Adders and snake-stones.—One does not hear very much about snake-stones in connection with British serpents, but in tropical countries, where serpents are common, these curions charms or remedies—they are used in both ways—present a very interesting study. But the Eastern ideas on the subject have their counterpart in our country in Wales, Scotland, and in Cornwall. (An excellent account of “snake-stones” is given in ‘Our Reptiles and Batrachians,’ by M. C. Cooke.)

The superstition is that “about Midsummer Eve it is usual for snakes to meet in companies, and that by joining heads together and hissing, a kind of bubble is formed, which the rest, by continual hissing, blow on

till it quite passes through the body, and then it immediately hardens, and resembles a glass ring, which whoever finds shall prosper in his undertakings. The rings thus generated are called Gleinau Nadroeth; in English, "snake-stones" ('Antiquities of Cornwall,' by Borlase). I have heard of similar stories being told in Denbighshire.

A variety of this superstition is found in the Vale of Glamorgan, where the idea is that when the reptiles congregate they kill one of their species and weave or make on the dead serpent's tail a small ball. The snakes are said to be very fierce during the operation, and the victim is supposed to give vent to shrieks of agony. Here as elsewhere the snake-stone is regarded as a charm, and as bringing good luck to the possessor.

Moving masses of snakes.—Several correspondents have told me that they have encountered masses of snakes writhing together in a ball. I confess I do not quite understand this curious phenomenon seen on the open land. It would appear to be only explainable on the supposition that they had worked themselves out of their hibernating quarters *en masse* when thus encountered, or that a number had got together in the pairing season. Whatever the real signification of this curious circumstance, it would seem to be not very uncommon, as I have had no less than four accounts of it being seen in six months.
—Author.

PART II.

BRITISH SERPENTS IN COUNTIES AND LOCALITIES

ARRANGED ACCORDING TO THE AREAS DEFINED IN THE

COUNTY AND VICE-COUNTY DIVISIONS OF THE BRITISH ISLES

(FOR BIOLOGICAL PURPOSES)

COUNTY AND VICE-COUNTY DIVISIONS OF THE BRITISH ISLES.

(FOR BIOLOGICAL PURPOSES.)

ENGLAND AND WALES.

C. CHANNEL ISLANDS.

I. PENINSULA PROVINCE.

1. West Cornwall with Scilly.
2. East Cornwall.
3. South Devon.
4. North Devon.
5. South Somerset.
6. North Somerset.

II. CHANNEL PROVINCE.

7. North Wilts.
8. South Wilts.
9. Dorset.
10. Isle of Wight.
11. South Hants.
12. North Hants.
13. West Sussex.
14. East Sussex.

III. THAMES PROVINCE.

15. East Kent.
16. West Kent.
17. Surrey.
18. South Essex.
19. North Essex.
20. Herts.
21. Middlesex.
22. Berks.
23. Oxford.
24. Bucks.

IV. OUSE PROVINCE.

25. East Suffolk.
26. West Suffolk.
27. East Norfolk.
28. West Norfolk.
29. Cambridge.
30. Bedford.
31. Hunts.
32. Northampton.

V. SEVERN PROVINCE.

33. East Gloucester.
 34. West Gloucester.
 35. Monmouth.
 36. Hereford.
 37. Worcester.
 38. Warwick.
 39. Stafford.
 40. Shropshire.

VI. SOUTH WALES PROVINCE.

41. Glamorgan.
 42. Breeon.
 43. Radnor.
 44. Caermarthen.
 45. Pembroke.
 46. Cardigan.

VII. NORTH WALES PROVINCE.

47. Montgomery.
 48. Merioneth.
 49. Carnarvon.
 50. Denbigh.
 51. Flint.
 52. Anglesey.

VIII. TRENT PROVINCE.

53. South Lincoln.
 54. North Lincoln.

55. Leicester with Rutland.

56. Nottingham.
 57. Derby.

IX. MERSEY PROVINCE.

58. Cheshire.
 59. South Lancashire.
 60. West (*i.e.*, Mid) Lancashire.

X. HUMBER PROVINCE.

61. South-east York.
 62. North-east York.
 63. South-west York.
 64. Mid-west York.
 65. North-west York.

XI. TYNE PROVINCE.

66. Durham.
 67. Northumberland, South.
 68. Cheviotland, or Northumberland, North.

XII. LAKES PROVINCE.

69. Westmoreland with North
 Laneashire.
 70. Cumberland.
 71. Isle of Man.

SCOTLAND.

CHAPTER XIX.

COUNTY AND DISTRICT DISTRIBUTION.

METHOD OF INVESTIGATION—SOURCES OF INFORMATION—
COMPARISON OF RESULTS OBTAINED.

THE study of the variations of the species in any given order of animals is one of the most fascinating in Natural History, and what follows in this book is an attempt to indicate the most important differences of distribution and relative frequency of our three British serpents; and as it is, as far as I am aware, the first attempt of its kind in this branch of our fauna, it must necessarily be imperfect. A perusal of the various county records will show that it would be the work of a lifetime for any one investigator to thoroughly work up the Ophidia of every county, even in a small country such as ours. The only practicable method is to enlist the aid of field naturalists all over the land, and compare and tabulate the results so obtained. This has been the method I have adopted, being encouraged to do so by the very

large number of correspondents I have had in the last few years, all of whom were evidently interested in the subject. I have endeavoured to get a record of our serpents for every county in the kingdom, and for this purpose approached the secretaries of Field Naturalists' Clubs in all those counties where such societies are working. In each case my inquiries took the same form, and the queries are reproduced here in the hope that future correspondents will supply me with local records on these lines. The questions asked were:—

1. Which snake is most common in the county (or district) of — ?
2. What is the average length of the adder here?
3. What is the average length of the ring snake here?
4. Does the smooth snake occur to your knowledge?
5. Does the small red viper occur?
6. Kindly add any other note on snakes you deem of interest.

The quotation of the questions will explain the uniform nature of the arrangement of the county reports.

In addition to field naturalists I have had the assistance of some of the curators of our museums, and of authors of books on county fauna, and have so been able to bring together a mass of facts which, though some of it was in existence before, was so scattered that it was not available for purposes of comparison.

In arranging the information I have grouped the counties according to the sheet recently issued (prepared by Alex. Somerville, F.L.S.), and called "The County and Vice-County Divisions of the British Isles," for biological purposes. Some districts have supplied much fuller information than others, for the simple reason that where snakes are not, there is nothing more to say.

At first sight there would appear to be some direct contradictions in the records of some counties, but on closer examination it will be found that where two observers disagree in their statements they refer to different localities, though it may be the same county. This very local distribution is a striking feature in British serpents, and is to be noticed in many counties. People who live on different sides of the same range of mountains, though perhaps in the same county, may make directly opposite statements as to which serpent is the most common, and both are probably right. Adders particularly keep to very much the same place, if the process of civilisation around them is fairly stationary; and there are places where adders abound, the persons living a few miles off being quite unaware of their existence, because the reptiles stop in the same place. The ring snake is not quite so local in its habit, and wanders farther afield. These facts should be borne in mind in comparing the statements made by various correspondents. Not quite so easy of explanation is the great

difference shown in the average size of our adders in different localities, and this is a question that awaits elucidation. The fact that the small red viper occurs in fifteen counties where the ordinary adder is also found, though the two differ greatly in size as well as in appearance, is very interesting. But the adder itself also exhibits great variation in size. Thus in Sussex it seems to attain its maximum size at 20 inches, while in Herefordshire the average is 24 inches, and specimens of 26 inches are not unusually taken; and in Scotland 24 inches is a very usual measurement. In Devonshire the size varies greatly in different parts, and in this case the small measurements may be those of the small red viper, the large one the ordinary adder, as both varieties are found in the county.

In the Isle of Man, as in Ireland, there are, I am informed, no snakes at all; and the same local immunity is reported from Guernsey and Sark.

Finally, we may sum up the most prominent features of the county and local records, taking the areas in groups, as divided in the biological chart referred to above.

I. Peninsula Province.

Vipera berus.—There is no doubt that the adder is more common than the ring snake in Cornwall; but opinions differ regarding Devon, no doubt because the two snakes have their own habitats. In the latter

county the length varies greatly, being estimated at 12 inches in one part and at 27 in another part of Devon. The former figure refers in all probability to the small red viper. The most usual average over the whole area is 18 to 20 inches.

Tropidonotus natrix.—The ring snake is frequently found in Devon and Somerset, but not so often in Cornwall. The ordinary length of $2\frac{1}{2}$ to 3 feet is observed.

The small red viper occurs in Devon, but *Coronella austriaca* is not found anywhere in this area.

II. Channel Province.

Vipera berus.—In the Isle of Wight the adder is the most common snake, and is very frequent in all this area with the exception of the county of Wiltshire. It is perhaps most common in Mid-Dorset, though there are, of course, numbers in the New Forest. In Dorset its period of hibernation seems shorter than in most places, as it is often found active in February. It averages 18 inches over the greater part of this area.

Tropidonotus natrix.—The ring snake is universally distributed in the Channel Province, being extremely frequent in parts of Wiltshire. In the New Forest its proportion in numbers to the adder is estimated at 10 to 1. It was from this place that Lord Londesborough obtained his large specimen of 5 feet 8 inches. In this forest also the famous Brusher Mills has

killed some thousands of snakes in his lifetime. The average length is fairly uniformly $2\frac{1}{2}$ to 3 feet.

Coronella austriaca.—As one would expect from climatic considerations, our reptiles show a decided preference for the southern counties of England, and this division of the counties includes the only area in which the smooth snake is seen at all frequently—namely, Bloxworth. It is also found in Hants, but more often in Dorset than elsewhere, its peculiarly local distribution being hard to account for. Possibly a very careful investigation in some other southern localities might reveal its presence where it is so far unrecorded.

The small red viper occurs in Dorset and Sussex, and in all probability in other parts of this division.

III. Thames Province.

Vipera berus.—This is another division prolific in reptiles, especially in its southern portions. The chalk downs of Kent are famous for adders, and some of the spots in the neighbourhood of Dover are described as being infested with them in some seasons. The average size in most parts is 20 inches or thereabouts, an adder of 2 feet being considered a very large one,—a striking contrast to Herefordshire, for instance, where that figure is the average for male adders. There are a good many localities in this division where the adder outnumbers the ring snake, especially some places in Surrey, another example of

what is seen so often, the adder keeping to a restricted area, and there becoming very numerous for a time.

Tropidonotus natrix.—The ring snake is to be found fairly universally distributed all over this division, and, with the possible exception of Surrey, is more common than the adder in every county of the division. It averages up to 3 feet, as elsewhere in the south.

Coronella austriaca.—There are two points of interest concerning the smooth snake in the Thames Province. The first is, that at a former period, some twenty years ago, it was an inhabitant of Berkshire, where it is apparently no longer found. The second is, that it occurs in Surrey, and from the observations of Mr Bryan Hook it seems quite probable that it may be in considerable numbers in this county. No doubt it is usually mistaken for the adder and killed forthwith, many specimens thus being lost to county records. Unfortunately the class of people who come across more of our serpents than any one else—the various workers on the land, that is—look upon them from one point of view only, namely, as things to be destroyed on every possible occasion.

The small red viper has been taken in Berks in this division.

IV. Ouse Province.

It has proved difficult to get much local information for this area, but one finds that the ring snake is the

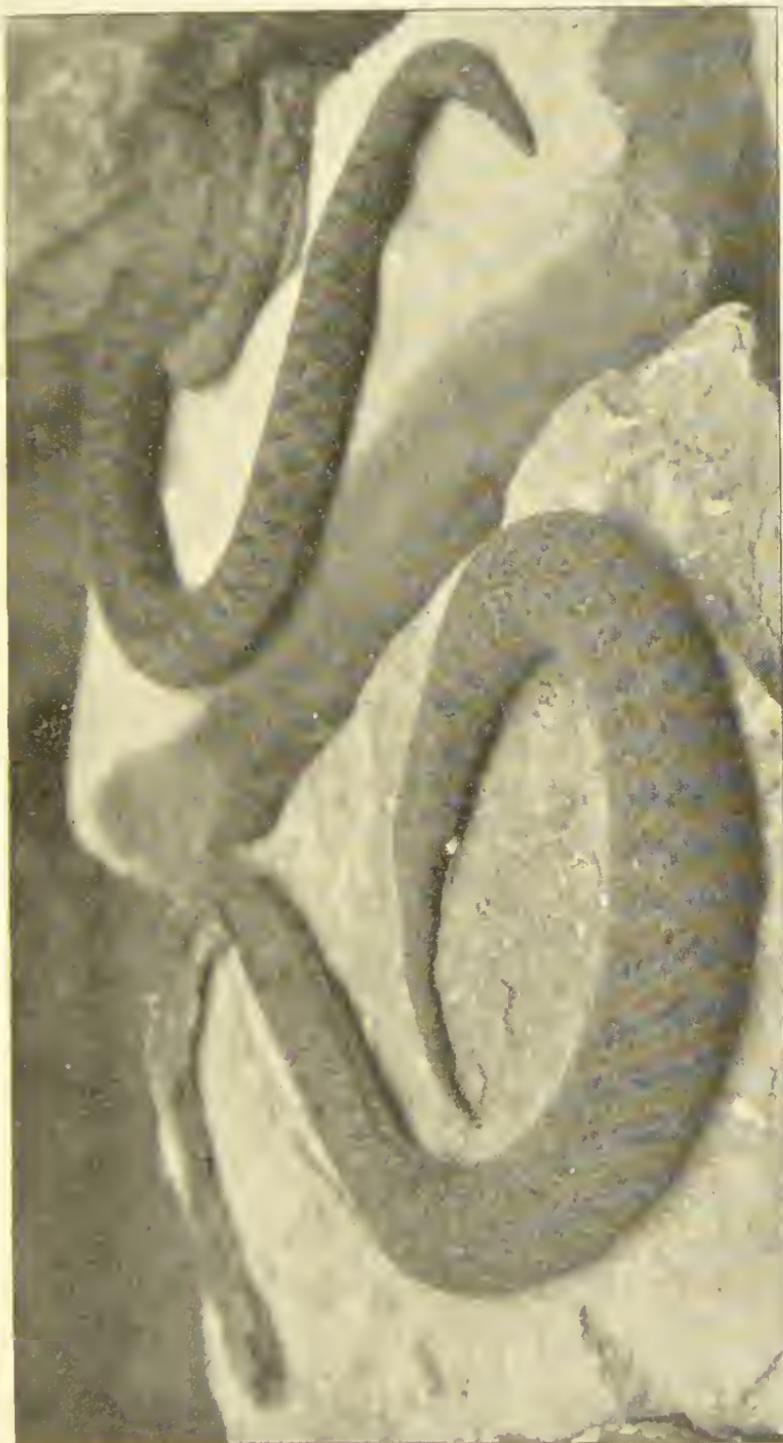
more common all over the province, the adder apparently being rarer than it used to be. The ring snake seems to have a slightly larger average length here than farther south, specimens of $3\frac{1}{2}$ to 4 feet being frequently found.

V. Severn Province.

Vipera berus.—Here we have a division which includes some of the snakiest places in the country for both adders and ring snakes; but, as elsewhere, the distribution is very local. Herefordshire is referred to in detail elsewhere, and no more need be said here than to recall the average length of adders on the southern border of the county, where they are probably larger, as a rule, than anywhere else in England, the average size being the maximum of Boulenger's English averages—25 inches. Very large adders are found in some Monmouthshire districts, while in other parts a much smaller average obtains. In this province the adder is more common than the ring snake all along the western border of the province, from West Hereford to the Forest of Dean.

Tropidonotus natrix.—In all the remaining counties and districts of the province the ring snake predominates, and in some places is very abundant. Gloucestershire, perhaps, has it in more abundance than the rest, and here it is very common. In the Churnett Valley, Staffordshire, too, it is plentiful, and is of a fairly uniform average length everywhere in the province.

FIG. 45.—FEMALE (26½ in.) AND MALE (24½ in.) ADDERS, MONMOUTHSHIRE.



Both adders and ring snakes are found in the Forest of Dean.

I have taken the small red viper in Hereford and Monmouth, and it almost certainly occurs in Gloucestershire, and in the Forest of Wyre in Shropshire.

The smooth snake is unrecorded in this province.

VI. South Wales Province.

Vipera berus.—The adder is very common in the mountainous districts of Pembroke, Cardigan, and Caermarthen, and often attains a length of 2 feet there. This province has been little worked for serpents, but I believe, from correspondence in my possession, that inland from Cardigan Bay the Ophidia are almost as numerous as anywhere. Parts of this district are wild and undisturbed, and a systematic investigation would probably yield some interesting results.

Tropidonotus natrix.—The ring snake in Breconshire attains its maximum average in the country—namely, over 4 feet—and larger specimens are found not uncommonly. The whole of this province affords excellent “cover” for snakes, and they have here also a minimum risk of extermination. It is difficult, however, to get very much reliable information for this province, Naturalist Clubs and competent observers being few and far between.

Just as these pages go to press a very interesting new fact in this province is brought to light. A speci-

men was sent to me by the Rev. C. Davies, Cenarth, Caermarthenshire, for identification. It turned out to be a variety of the adder known as the "black adder" (the *Coluber prester* of some writings). This specimen was a female $20\frac{1}{2}$ inches long, and is the first recorded in this part of the country. Still more interesting is the fact, which I have since ascertained, that the black adder is not uncommon in the neighbourhood of Cenarth, though but rarely killed on account of the great dread the inhabitants have of its danger. There are two specimens in the South Kensington Museum taken in this country, and a considerable number from the island of Seeland, where they seem fairly common. G. A. Boulenger has given special attention to the production of the melanism which he described in the 'Zoologist' of February 1895. He has shown that the black colour is produced differently in the two sexes: in the males by the expansion of the black markings, in the females by "a gradual darkening of the ground colour."

VII. North Wales Province.

Vipera berus.—The distribution in this province is very irregular, common in some places, in others the adder is apparently absent.

Tropidonotus natrix.—This species is generally distributed in North Wales, in some places growing to a large average size.

VIII. Trent Province.

Vipera berus.—On the east side of England the adder is less common than farther west, and also of a somewhat smaller average size, rarely being found more than 20 inches in length. Nevertheless, the largest adder recorded—or one of the largest—was from, Scotton Common in Lincolnshire. It was killed by Mr F. Boyes of Beverley, who wrote to ‘The Field’ thus: “I wish to record that, when on Scotton Common in Lincolnshire on Whit-Monday, I killed a viper of extraordinary length and peculiar colour, the back of the head deep yellow and black bands; it measured 2 feet 11 inches full. This is the longest I have ever killed.”

Several correspondents have drawn my attention to the fact that the adder is found in some marshy places in the east of England—an interesting variation of its usual habit of rather avoiding damp spots. This is not the case in the valley of the Trent itself, where the adder is found to inhabit the sandhills mainly.

Tropidonotus natrix.—The ring snake is the most common ophidian all over the Trent Province, except in parts of Derbyshire, where it is less common than the adder. As this county is of a very different nature to the others, a different distribution of the serpents is only to be expected. The usual length of the ring snake in this province is from $2\frac{1}{2}$ to 3 feet.

The small red viper occurs in Lincolnshire, and probably in Leicestershire. *Coronella austriaca* is unknown in the Trent Province.

IX. Mersey Province.

Vipera berus.—The adder is not common in this area, which is not surprising when one considers the immense population included in the province, especially in the South and West Lancashire portions. Even in Cheshire it is seldom met with, and does not exceed an average of 18 inches.

Tropidonotus natrix.—Delamere Forest in Cheshire holds a good many ring snakes, the average length being 3 feet. This species is by far the most common in the Mersey Province.

Neither the small red viper nor the smooth snake occur, as far as known at present.

X. Humber Province.

Vipera berus.—The adder in Yorkshire exhibits great variation, the size of the county being so great as to allow of vastly different local conditions in various localities. Thus the size is found ranging from 15 to 27 inches, two species being probably involved. In the south and east of the province the adder is probably more common than the harmless species.

Tropidonotus natrix.—Great variation of size is shown also in the ring snake here, and in North

Yorkshire it has the smallest average length of anywhere in England, while in some other parts of the county it grows to 4 feet.

The small red viper may be represented in some of the small adders of this province, but the smooth snake is unrecorded.

XI. Tyne Province.

Vipera berus.—This is a province where the adder is by far the most common of our serpents, except in one locality in the extreme south of Durham. In all other parts the adder predominates, some observers even considering it the only species indigenous to the province. It has the large average length of 2 feet.

Tropidonotus natrix.—The eastern slopes of the Cheviots furnish what ring snakes are found in this province; at any rate the species is very rare in other parts.

The small red viper is found in both counties of the province, but the smooth snake is, as usual in the northern counties, unrecorded.

XII. Lakes Province.

Vipera berus.—According to the biological system of county classification, which is adopted in these records, the Isle of Man comes in the Lakes Province. But the report furnished of snakes in the island states one thing only—namely, that there are no snakes there at all, so that from an ophidian

point of view the Isle of Man shares in the immunity likewise possessed by Ireland. The value of this biological grouping of counties and localities is well shown in this province, where a very different state of things obtains from that which was noted in South and Mid-Lancashire. There snakes were rarely seen, civilisation having driven them elsewhere or exterminated them locally; but in North Lancashire the contrast in the scenery is no less striking than the animal distribution. The adder is the common serpent of the province, and very large specimens are taken, especially in Westmoreland. The inland fringing Morecambe Bay is also a habitat much frequented by the species.

CHAPTER XX.

I. PENINSULA PROVINCE.

- | | |
|----------------------------------|--------------------|
| 1. WEST CORNWALL
WITH SCILLY. | 3. SOUTH DEVON. |
| 2. EAST CORNWALL. | 4. NORTH DEVON. |
| | 5. SOUTH SOMERSET. |
| | 6. NORTH SOMERSET. |

Cornwall.

"The adder is by far the most common and widely distributed snake in this county. Many instances occur of people and dogs (especially hounds) being bitten by this species.

"In the two years 1898-1900 I killed six male and five female adders. The males averaged $20\frac{1}{4}$ inches long, the females half an inch longer. The largest male was $24\frac{1}{2}$ inches, the largest female $22\frac{1}{2}$ inches, these being a pair taken together. The smallest male was $13\frac{1}{2}$ inches, the smallest female $18\frac{1}{2}$ inches, these two also being a pair. Of the eleven adders killed there were three pairs: nine were killed in the month of April, one in May, and one in August.

"The adders are often to be seen in April coiled up together basking in the sun. They are found chiefly on the cliffs, on the moors, and in the brakes; not being seen so frequently in the heather and ling localities, though adders are often found at the Lizard (*i.e.*, the geographical Lizard).

"The grass or ring snake is not so common, and the smooth snake unrecorded, in this county."—C. M. Rogers, Perranwell, Cornwall.

Devonshire.

"I should certainly say that the adder was more common than the ring snake in this county. Its average length is 18 inches, but one has been killed measuring 33 inches. The ring snake averages 30 inches in length, and one in the Torquay Natural History Museum measures 3 feet 8 inches.

"The smooth snake is not known here."—Alex. Somervail, Torquay Museum.

"The adder is the more common near the moors, the ring snake in the more cultivated districts. The adder averages about a foot, the ring snake about 30 inches, but it is not at all unusual to find ring snakes measuring 3 feet. The smooth snake does not occur, to my knowledge."

"The number of snakes seen, or their traces in the dusty roads, varies very greatly from year to year: the drier the summer the more the snakes get about."—Edmund A. Elliot, M.R.C.S., Kingsbridge, Devon.

"Adders, ring snakes, and lizards are all plentiful

in this county. At birth the adder is 6 inches long, the full-grown males being 24 inches, the adult females as much as 27 inches. The ring snake is 7 inches long at hatching, attaining a length of 3 feet 6 inches when full grown. I have not found the smooth snake."

—H. P. Hearder, 26 Westwell Street, Plymouth.

MID-DEVON.—"There is a good deal of difference of opinion as to which is the more common, the adder or the ring snake; probably the latter is. Those who live on the hills see the adder most, while those in the valleys find the ring snake more common. The adder averages just under 2 feet, and the ring snake about 30 inches. The small red viper occurs."—Dr Dale, Tiverton.

DARTMOOR DISTRICT.—"The adder is still very plentiful here, and is far the most common species. During the Easter holidays in 1899 no less than nine were secured in the neighbourhood of this house without being searched for. The adult adder measures about 20 inches long here. In colouring there is great variation. Of the nine mentioned, hardly two were quite alike, though the dark-brown colouring is commonest. The colour seems to depend chiefly on locality. The adder found on the red and rich land which is so valued in Devon is found to be red, and is the same size as those found elsewhere.¹

¹ This is the most definite example of colour protection I have heard of in British adders.—Author.

"The ring snake is getting scarcer year by year. The largest ones found are, as a rule, about 30 inches long.

"The smooth snake does not occur in this neighbourhood."—Rev. Gregory C. Bateman, Low Down, R.S.O., Devon.

Somerset.

"The ring snake is the commonest snake in the lowlands; in the higher lands (Mendip) the adder is the more frequent. We rarely find the adder in the low-lying lands bordering the moors. On the slopes both are met with, the ring snake being the more numerous. On the top of Mendip, which is nearly 1000 feet up, one rarely finds the ring snake, while the adder is common; and I have come across them many a time coiled up in the sun under the firs. The full-grown adder averages 27 inches long, the full-grown ring snake 3 feet. The smooth snake does not occur, as far as I know."—H. E. Balch, W. Laura Place, Wells.

"In the neighbourhood of Glastonbury ring snakes are plentiful, the largest I have measured being 3 feet 3 inches. Adders are met with among the peat-cuttings and low-lying parts of Mid-Somerset. The largest I have seen was 2 feet 2 inches. There are a number of adders on the Quantock Hills: my brother killed one there about 12 inches long, and a labourer passing by told us that was about the

average size there, and that he had killed as many as fourteen in one day. During flood-time in these low-lying parts of Mid-Somerset the ring snakes and adders take to the trees, and I know a willow-stump on which a rabbit, a rat, and a snake were seen seeking safety together."—Arthur Ballied, Midsomer Norton, Somerset.

CHAPTER XXI.

II. CHANNEL PROVINCE.

- | | |
|--------------------|------------------|
| 7. NORTH WILTS. | 11. SOUTH HANTS. |
| 8. SOUTH WILTS. | 12. NORTH HANTS. |
| 9. DORSET. | 13. WEST SUSSEX. |
| 10. ISLE OF WIGHT. | 14. EAST SUSSEX. |

Wiltshire.

“Though I have lived all my life in North Wilts I have never seen an adder. The ring snake, on the other hand, is common.”—Rev. Ed. H. Goddard, Clyffe Vicarage, Wootton Bassett.

“Years ago, when I lived in Wiltshire, I knew the ring snake to be very abundant in some localities.”—Richard Howse, Museum Nat. Hist. Soc., Newcastle-on-Tyne.

Dorsetshire.

“*Ring snake*.—In the district of Bloxworth it comes up from the woods and heaths in considerable numbers every summer to deposit its eggs in fermenting

heaps of dead leaves and other vegetable refuse. It appears to possess an instinctive knowledge of these heaps, as at a distance of two or three fields I have seen them emerging from the woods and making their way in a direct line for them. The largest ring snake I ever met with myself was on Bloxworth Heath, and it measured exactly 4 feet 2 inches in length. I have a variety found on Bloxworth Heath which I imagine to be unique. It is of a uniform pale-whitish colour, with a well-defined longitudinal central dorsal pale yellow-brown band. No trace of the characteristic yellow ring at the back of the head was visible.

“*Smooth snake*.—This snake was first discovered in England by the late Mr Frederick Bond and myself, between Ringwood and Wimborne, in 1853. It was only recorded as British in 1859. It is not infrequent on the Dorsetshire and Hampshire heaths, where it is often mistaken for the adder, and suffers accordingly. It is of a brownish hue than the common ring snake, and so far bears a superficial resemblance to the adder, but lacks the dark zigzag line of the latter, and is of a more slender form. Its length is from 18 to 25 inches.

“*Adder*.—It is certainly not abundant, though frequent in the Bloxworth district, and is found more in the woodlands bordering the heaths than on the heaths themselves. Its length is from 18 to 24 inches.”—‘Reptiles of Dorset,’ by Rev. O. P. Cambridge, M.A., F.R.S.

WEYMOUTH DISTRICT.—“The ring snake is the most common snake in the Weymouth district, though I have found the adder frequently in other parts of the county, restricted, however, to certain localities. I have one specimen of the adder preserved which measures 15 inches. Probably they are often larger, perhaps 18 inches. I have two specimens of the ring snake preserved measuring 26 and 31 inches respectively. The smooth snake occurs occasionally on the heaths.” — Nelson M. Richardson, Montevideo, nr. Weymouth.

“During the last thirteen years I have caught over 150 adders and more than double that number of ring snakes. I have been bitten four times by adders, and have the marks of the fangs on my finger now after two years. After the first two bites I did not suffer much, though the part swelled up and throbbed, but I sucked it well and applied ammonia.

“I have found the ring snake to be the most common, the average length being 30 inches, though of course they do occur much larger, the females being the longest. The adder is found up to 2 feet, not often larger, and in this species also the female is the larger. I have seen the smooth snake, but never caught it, though they are caught in the New Forest, Hants.

“Two adders I had in captivity brought forth young, one having eleven, the other nine young ones. I brought six of the young up on milk and the minced flesh of rats.



FIG. 46.—RING SNAKE.

"I have observed that adders when caught usually disgorge their last meal. I have never seen them attempt to swallow their young."

"Ring snakes choose fresh cow-manure if available to lay their eggs in, and they visit the eggs in the evening. The eggs are laid in May or June, but I caught five ring snakes in a manure-heap in July this last summer (1900). When taken away, strange to say all the eggs went bad, and not one of them came out"—A. Old, 3 Byne Road, Sydenham, S.E.

CENTRAL DORSET.—"In this part of the county—a place untouched at present by the newest forms of civilisation, and nine miles from the nearest railway station—both ring snakes and adders are plentiful, and may be seen in numbers in the spring. In my immediate neighbourhood there are large coverts, and frequently, when shooting these for the last time at the end of the winter, adders are killed in numbers. On one occasion, two or three years ago, seven adders were slain by the beaters in one morning at Kings-grove Wood in the parish of Piddletrenthide. I was present at the time, and besides these seven several more were seen. Even more common is the ring snake, and I know of one lane which is infested with them in the spring-time. When riding down this lane this year my horse kept on shying at the reptiles, which were creeping away in all directions. On another occasion, when shooting in the month of

September, I saw a remarkable sight—viz., nine ring snakes go in one after the other from some clover, which lay well to the sun. A friend who was with me at the time was jumping about in all directions to avoid them. This happened on Bookham farm in this parish. I have questioned my keeper, who is a native of Central Dorset and worked for thirty years at one place near here, and he has given me the following items from his own experience:—

“ 1. He has killed about twenty ring snakes and twenty adders in 1899.

“ 2. He once killed three at one shot.

“ 3. He killed two adders during the first week of February 1900 (very early for them to be astir).

“ 4. He has killed a ring snake 33 inches in length, and found twenty-eight young ones.

“ 5. He once found a ring snake in a bird’s nest in a hedge.

“ 6. He killed nine slow-worms in one of my fields when haymaking this year (1900).

“ 7. He has seen specimens of small red vipers in Melcourt Park and black adders at Doles Ash (both places some three miles from here).¹

“ 8. He once found a ring snake in a flint.

“ The adder averages from 18 to 23 inches here, and the ring snake from 30 to 36 inches. I have never seen the smooth snake.”—Rev. F. W. Brandreth, M.A., the Manor, Buckland Newton, Dorchester.

¹ Cf. Essex, Caermarthen, and Northumberland, pp. 279, 311, 332.

Hampshire.

This is one of the few counties where all our six British reptiles are found—in this respect like Dorset.

“*Vipera berus* or *Adder*.—Universally distributed, including the Isle of Wight, but most common on light soils. The ground colour is most variable, either brown, or red, or grey, or almost blue, or almost white. The country people declare that the red viper is a different species, and the line down its back is not black but brown, yet perfectly distinct. The proportion of red vipers in the New Forest is said to be about one in ten of the venomous species. An excellent observer in the island, the late Rev. G. A. Bury, who said that he often counted seven or eight adders in one walk in the spring, believed that vipers are always red when young, and had never seen a young one that did not answer the description of the so-called red viper. Another variety of the viper is almost black, the line only showing in certain lights, so that it is a safe rule to avoid black snakes when you meet them. These black vipers are found in the Forest and in the Isle of Wight.¹ The Forest people tell me that ‘adders is fattest in March month,’ which shows they have finished hibernating at that time. In Davenport Adams’ ‘Isle of Wight’ we read of their bunching in winter. ‘Near

¹ Cf. Essex, Caermarthen, and Northumberland, pp. 279, 311, 332.

a bushel' were found at Alverstone, and after a gun had been discharged into the heap, seventeen heads were counted.

"*Tropidonotus natrix* or *Ring Snake*.—Universally distributed, but said to be less common in the Isle of Wight than the viper.

"*Coronella austriaca* or *Smooth Snake*.—Locally distributed: found in the New Forest and in the north-east of the county. Absent from the island. One was caught in my garden on July 6, 1894. Mr G. B. Corbin, of Ringwood, reported one from his neighbourhood in August 1897. One was taken in August 1883 on the hills between Yately and Camberley, on the borders of Hants and Surrey. Its usual colour is silvery-grey."—Rev. J. E. Kelsall, Milton, Lymington (Proceedings of Hampshire Field Club, vol. iii., Part III., 1898).

"In the area worked by the Portsmouth and Gosport Nat. Sci. Soc. (which extends from the Tichfield river on the west northward until it reaches Wickham, thence eastward following the boundary of the Fareham district down to Langstone Harbour, and round the shore to the Tichfield river again) the adder is the most common snake found. In this area the average length is from 18 to 20 inches, but one measuring 22 inches was taken at Stokes Bay in April 1882. Near the seashore there is much common land covered with gorse and bracken, whilst in the northern part of the district there are exten-

sive copses, the remains of the once large Forest of Bere. Both of these places are, of course, very well adapted for the shelter of adders.

"The ring snake grows usually to a length of 3 feet. One female taken at Hilsea in 1885 measured 42 inehes and contained 22 eggs.

"The smooth snake does not occur in the area to which these notes apply."—Charles Foran, Norman-ton, Southsea.

HAYLING ISLAND.—"Adders are common here, but the grass snake I have never seen during a residence of thirteen years, and I cannot learn from labourers and keepers that it has ever been seen by them. The adders are certainly larger than those I have seen in Wilts."—A. May, L.R.C.P., Chandos, Hayling Island, Hants.

PORTRSMOUTH DISTRICT.—"In the Portsmouth district I have come to the conclusion that I have met with as many adders as ring snakes, though formerly I thought the latter species the more common. I think both are fairly equally distributed throughout the district. The largest adder I have measured was 21 inches, killed at Stokes Bay in April 1883. In that same year I obtained a female ring snake from a man who had killed it on the Hilsea Lines (Earth-works), Portsea Island, which measured 42 inehes and contained 22 eggs. I saw another quite as large

in Stakes Wood some years later. Three feet is a usual length here for this species." — W. Pearce, East Cranbourne Road, Gosport.

Sussex.

"In the east part of the county the ring snake is the most common snake, but near the sea the adder becomes the more common. The ring snake averages from 24 to 26 inches in length, the adder about 18 inches. Occasionally the ring snake attains a length of 3 feet. I have not heard of the smooth snake. I have taken several female specimens of adders in young, all of which have been of a dull brownish-yellow in colour. I have a specimen preserved which is of a ruddy tint and about 16 inches long. I kept both adders and ring snakes for some time, and knew a good many localities for them near Hastings and Lye, the above being the result of my own observations." — L. B. Hall, 1 Quarry Place, Hastings (now 7 Union Road, Tufnell Park, London).

"I think that the ring snake is diminishing in numbers, perhaps owing to the ease with which it is caught and killed. The adder, on the other hand, seems to be on the increase in some localities, and, on the whole, I have seen it the more frequently of the two. It averages often about 13 inches, though I have found it up to 18 inches in the western part of the county. The ring snake is generally about 28 inches long; the largest I have

seen measured 3 feet 2 inches. It is fairly common in the central part of the county.

"The small red viper occurs in the fir-clad hills of the extreme west of the county, being absent in the eastern parts, where the adder is ash-coloured (Brighton, Lewes, and Crowborough). The ring snake is common throughout the Weald, confining itself to well-watered land."—Benjamin Lomax, 4 Cleveland Road, Brighton.

SOUTH-EAST SUSSEX.—"In the course of ornithological rambles in the south-eastern part of the county I have had many opportunities of observing our snakes in their wild state, and I have also kept them as pets, and so observed them also in captivity. In the district referred to I consider the ring snake common, and far more numerous than the adder. The ring snake averages about 2 feet 9 inches and the adder about 21 inches in length. The largest ring snake I have seen in this neighbourhood was one which was brought to me, and which measured a trifle over 4 feet. These remarks apply to the S.E. portion of the county only."—Walter Field, St Helens, nr. Hastings.

ST LEONARDS.—"In the district the ringed snake is much more common than the adder, probably in the proportion of seven to one. Its average length is 34 inches. Although this species is generally sup-

posed not to bite, I had one specimen (2 feet 7 inches) which I could never take out of her cage without an attempt on her part to bite me—an attempt, moreover, which was frequently very successful. I have at present in captivity a ring snake which is so tame as to readily take a frog from my hand whilst itself being held in the other; and this snake will also come the whole length of a room to my whistle. Shortly after I captured her she deposited 29 eggs, none of which was I successful in hatching.

"The adder averages here about 20 inches. I have no knowledge of the occurrence of the smooth snake or the small red viper in the immediate locality."—A. Cheshill, St Leonards.

ARUNDEL DISTRICT.—"In this district I should say that the ring snake is more common than the adder, though the latter is also pretty plentiful. In my experience I should put the average length of the harmless species at about 2 feet, and that of the adder at about 21 inches, locally. I have never come across the rare smooth snake here."—Leslie E. Lewis, Binsted Rectory, Arundel, Sussex.

EASTBOURNE DISTRICT.—"Speaking from personal observation of the country within a fifteen-mile radius of Eastbourne, I should say that the ring snake is undoubtedly the most common species found. The

adder is, however, by no means uncommon, though owing to its great timidity it is perhaps thought to be rarer than is really the case.

"The adders of this locality are found ranging up to 20 inches, or even to 2 feet (this district is on chalk).

"The ring snakes are usually about 3 feet, and this size and larger are frequently seen in the woods and marshes. The largest I have taken here was 3 feet 9 inches, his cast slough being over 4 feet. This specimen was among the gorse of a South Down valley.

"I have never seen the smooth snake here, though I have been on the look-out for it for years.

"I have hatched both adders and ring snakes in my cages, and have been very much struck by the difference in ground colour, distinctness of markings, and vitality among individuals in the same litter, more especially in the case of the adders."—H. G. F. Spurrell, Clonsah, Eastbourne.

CHICHESTER DISTRICT.—"The ring snake is very common in the lower-lying parts and the viper in the sandy places. The former averages about 30 inches, at times reaching a length of from 43 to 46 inches. The adder varies from 18 to 24 inches. I can get no information regarding the occurrence of the smooth snake.

"The ring snake is a pretty pet, and can be perfectly tamed. It is very interesting in its ways, being most inquisitive, investigating everything minutely. A capital swimmer, fond of a bath, a more timid creature hardly exists, and few as harmless."—Joseph Anderson, Alve Villa, Chichester.

CHAPTER XXII.

III. THAMES PROVINCE.

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| 15. EAST KENT. | 20. HERTS. |
| 16. WEST KENT. | 21. MIDDLESEX. |
| 17. SURREY. | 22. BERKS. |
| 18. SOUTH ESSEX. | 23. OXFORD. |
| 19. NORTH ESSEX. | 24. BUCKS. |

Kent.

DOVER DISTRICT.—“I should say that the ring snake is spread over a larger area—that is, its distribution is more general—whilst the adder is more inclined to affect certain suitable localities. Personally I have come across more adders than ring snakes, probably in the proportion of two to one. In this district we should consider an adder over 24 inches a very large one, and a ring snake over 36 inches would be very exceptional. Last summer (1900) a neighbour of mine killed a ring snake in his garden measuring $35\frac{1}{2}$ inches, which he brought to me as being a large one.”—W. Jacob, Eythorne, nr. Dover.

ABBEY WOOD DISTRICT.—“In the neighbourhood of Abbey Wood the ring snake is common, and averages 30 inches in length. I have seen specimens in my own and in neighbours’ gardens. When working Chattenden Woods at Cliff Kent for entomological purposes, I have disturbed a great number of ring snakes, and I should say they averaged 3 feet in that locality.

“When I lived at Abbey Wood no adders had been seen there for some years. I am not aware of the smooth snake being found.

“I found in a ring snake which had been killed and brought to me a full-sized toad (*Bufo vulgaris*), and another which was brought alive *ejected portions of a bird*.”—Arthur S. Poore, 47 Griffin Road, Plumstead.

“The ring snake is the commonest snake of the county, averaging about 37 inches, though I have seen them as large as 3 feet 9 inches—these latter very rarely. The adder averages 23 inches, and I have found them growing to a length of 2 feet 1 inch, but that is not usual. The smooth snake does not occur, to my knowledge.”—Fred. Roberts, Tunbridge Wells.

“At a place on the chalk downs about three miles from Dover adders are very numerous, and on a warm spring morning I have seen dozens of them basking in the sun. Near Farthing Common, about fifteen miles from Dover, I have seen many adders. During the late spring and early summer a great number of young adders, about the size of earthworms, may be found in

open spaces in the woods around Dover, as well as upon the grassy slopes of the downs; but most of these must perish in some way, or the woods would soon become infested."—W. Haydon, 8 Amberley Street, Liverpool.

EAST KENT.—"The largest adder I have ever seen was one that I took alive, some thirty-five years ago, near Canterbury. It measured 27 inches."—W. Whitaker, F.R.S. (Pres. Croydon Nat. Hist. Club).

CANTERBURY DISTRICT.—"The ring snake or grass snake is the most common ophidian around Canterbury, and it is to be found with ease in considerable numbers in all the woods in the neighbourhood and on the sunny banks. Its average length is from 30 to 36 inches, although many larger than this are taken. I have myself taken one 5 feet 3 inches long, but up to 40 inches is a more general length. Those caught here are, as a rule, beautifully marked. The snake-habitats of the district are Chartham Woods, woods on the road between Stone House and Bekesbourne, Blean Woods, Whitehall, and on the banks and hills.

"The viper is also fairly common, being found in the Bekesbourne Woods and Chartham Woods, where I have seen a good many in one afternoon. This species here is mostly of a dark-brown colour on the head only, fairly arrow-head shape, and black spotting

not very well marked. Its bite is dangerous if not properly treated. My brother was once bitten by one just behind the nail on the thumb. He did little to it, but ran to a farmhouse, where he stayed exhausted until fetched away in a state of collapse, and was a week before being pronounced out of danger. His whole arm swelled to double its natural size, and was black and blue all over.

"In my experience the smooth snake is not to be found here at all; at any rate I have never observed it, or known any one to have seen one. Its distribution seems to be an extremely local one."—A. Lander, Hon. Sec. East Kent Nat. Hist. Soc., Canterbury.

Surrey.

"Personally I have seen more adders than ring snakes in this county, but that observation may be a local distribution. I have measured two as large as $23\frac{1}{2}$ inches, but these were above the usual length. I once took a full-grown slow-worm from the stomach of an adder which was taken on a heath near here."—Oswald H. Latter, Charterhouse, Godalming, Surrey.

FARNHAM DISTRICT.—"The adder is by far the most common snake here, but I have not measured specimens. The ring snake is hardly ever found upon these heathlands, and although I have taken them within ten or twelve miles of here, I have

never seen one nearer. The occurrences of the smooth snake are as follows:—

“1891. One killed by me in mistake for an adder, which I still have preserved.

“1898. One taken alive by me and sent to the Zoological Gardens, one killed by accident, and a cast skin of a third found by my children.

“1899. One killed in mistake for a viper (a young one).

“1900. One taken alive and handled by myself, and which I believe is still living.”—Bryan Hook, Churt, Farnham, Surrey.

OXTED DISTRICT.—“On July 7, 1900, I captured a large adder on Tatsfield Hill while collecting caterpillars. In picking these off some low-growing plants my fingers encountered the adder, and I brought my butterfly-net into play and caught the reptile in it. It measures 2 feet 2 inches in length and $3\frac{1}{2}$ inches in girth. I also caught a sandy-grey-coloured adder at the Warren, Folkestone.”—M. G. Palmer, Wilmer Museum, W. Norwood, S.E.

SUTTON.—“Many years ago I knew Sutton to be the happy hunting-ground of the adder. The Benhill Wood afforded shelter to innumerable adders, but Benhill Wood is now, I believe, Benhill town, but still the chalk pits in the neighbourhood must even now be their home. Many years ago a party

of schoolboys paid a visit to one of these chalk pits on a hot summer's day to collect shells, and came across scores of adders. One of the party caught one of the longest adders and tied it with a piece of string round his big straw hat, and thus took it home. Without any fear he proceeded to release his captive, when it ineconsiderately bit him on the wrist. It was not long before the hand and forearm began to swell and become painful. A doctor was called in, and he prescribed some outward application smelling strongly of ammonia. The swelling soon gave way to the treatment, and in about a week all effects had disappeared. I was that youngster."

—W. Haydon, 8 Amberley Street, Liverpool.

Essex.

"I do not think that either of our two common serpents are so common as they were sixty years ago, although even now there are many adders in the woods and on the marshes near the coast. I do not hear of so many sheep and cows being bitten on the marshes as in my childhood. It is often said (see the 'Field' quite lately) that the adder only occurs in dry sandy places. This may be true in some localities, but it does not apply in the case of our marshes near the 'sea-walls,' where they are still frequent. I could not state the averages exactly, as I have never measured any unless there was something unusual in the size. We find the

colour varies here as elsewhere. I have seen some on the marshes nearly black."—(Dr) Henry Laver, Colchester (author of 'The Mammals, Reptiles, and Fishes of Essex').

"The ring snake is fairly common in Epping Forest, where the adder is less abundant. The latter is found in the more northern parts, where the soil is more sandy. The black form of the adder occurs. The smooth snake does not occur, to my knowledge. Mr E. Fitch, F.L.S., writes me: 'In some years adders abound on our commons and on our sea-walls, but they have been much rarer of late years. I recorded the largest local ring snake in the "Essex Naturalist"; it measured 3 feet 3 inches, I think. This is far the most common species in Essex.' Mr Miller Christy says: 'I should say that the ring snake is vastly more common in the county than the adder, as the former is found in almost all parts, the latter only, or mainly, in the marshes or in woody or heathy localities, which are comparatively rare in the county.'"—Wm. Cole, Buckhurst Hill, Essex.

Hertfordshire.

"The grass snake or ring snake is the most common in this county, but is not often found. When it does occur its length varies from 24 to 36 inches. The adder is very seldom seen, and the smooth snake never, as far as I am aware."—A. E. Gibbs, County Museum, St Albans.

This is another county from which it appears to be very difficult to get any information about the serpents. The reason doubtless is, as I have elsewhere said, that the reptiles are scarce here. Indeed Mr Percival Westell says in a letter to me, "I am always rambling about in Herts, and find that both the adder and the ring snake are exceedingly rare. I never encounter either species."—Author.

Berkshire.

"The ring snake is the most common snake here. The adder is also found, never over 2 feet long. I have seen three specimens of *Coronella lavis*, the smooth snake, from one locality (last in 1882)."—J. W. Bevir, M.A., Wellington College.

"This summer a great many ring snakes were caught by members of the school. In July a curious variety of this species came under my notice. The belly was coloured dull white, with one longitudinal black line running from neck to tail. The snake was a small one about 16 inches long. The back was a dirty black colour. I have not seen any other like it in this country."—Zoological Report, Wellington College Naturalists' Soc., S. S. Flower, Director of Museum, 1886.

"I have taken both ring snakes and adders at Mortimer in this county, the former ranging from 12 to 34 inches, the adders from 12 to 24 inches. Adders are plentiful at Pamber Forest, near Reading,

where I have seen as many as a dozen in a day's fly-catching. Ring snakes are common in almost all parts of Berks. At Bear Wood last season (1900) I saw a great number of them rolling about together near the water, two of which I captured, measuring 32 and 34 inches long respectively. I find that the adders vary very much in colour in the same districts. A friend captured a specimen of the small red viper at Tyllhurst in this county two years ago, and I took one in the Caversham Warren, Oxfordshire, in the year 1864."—C. N. Allen, 102 Donnington Gardens, Reading.

"Adders are rare on the north side of the downs, but on the south side, near Hermitage and Newbury, they are met with more frequently. An under-keeper tells me that he has not seen one during seventeen years on the north side.

"We have many ring snakes, however, on this side of the downs, the size, roughly speaking, being anything up to 3 feet.

"The belief that the adder swallows her young is prevalent here, as in so many other localities."—Eleanor G. Hayden, Steventon, Berks.

Oxfordshire.

"Certainly the ringed snake is the most common—roughly speaking, in the proportion of 100 to 1. I am not aware of the occurrence of the smooth snake in this county."—Lilian Veley (Hon. Sec. Nat. Hist. Soc.), 20 Bradmore Road, Oxford.

Buckinghamshire.

"The ring snake is the most common, but does not appear to grow to the size generally given in books.

"The adder is rare in this county, at anyrate in South Bucks.

"Except at Burnham Beeches, I know of no neighbourhood where snakes can be found with certainty—a comparative rarity somewhat difficult to explain. I have never seen an adder in South Bucks, and have rarely heard of this species being captured."—M. D. Hill, Eton College, Windsor.

CHAPTER XXIII.

IV. OUSE PROVINCE.

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|-------------------|------------------|
| 25. EAST SUFFOLK. | 29. CAMBRIDGE. |
| 26. WEST SUFFOLK. | 30. BEDFORD. |
| 27. EAST NORFOLK. | 31. HUNTS. |
| 28. WEST NORFOLK. | 32. NORTHAMPTON. |

Suffolk.

"In the Ipswich district neither the adder nor the ring snake can be called common, though the adder is seen the more frequently of the two. It rarely exceeds 24 inches in length. The ring snake when found is between 24 and 30 inches. The smooth snake does not occur, to my knowledge."—G. H. Hewetson, Hon. Sec. Scientific Society, Ipswich (Notes from Mr Miller and Mr F. Woolnough).

Norfolk.

"I think I may safely say that there is no record of the occurrence of the smooth snake in Norfolk. The specimen of the ring snake in Norwich Castle Museum is 3 feet long, and Mr Fitt of Norwich has a fine pre-

served specimen, about 4 feet, taken in Norfolk. The Rev. M. C. Bird, of Stalham, writes to me: ‘The viper is more common in this part of Norfolk than the ring snake.¹ In fact, I have not seen one of the harmless species hereabouts at all. The average length of some score of vipers I have measured is $24\frac{1}{2}$ inches (adult), and I have seen a red variety, about 16 inches long, at Stalham, which was killed in the neighbourhood in the summer of 1889. A marshman friend of mine killed seven vipers in one day (April 10, 1900). One he killed on a previous day contained 25 eggs, and two killed the day before had 23 and 16 eggs respectively. These vipers specially frequent the dry marsh walls round the Broads, and are also fairly plentiful on the marshes adjoining the sandhills on the coast. They are much more conspicuous in spring and early summer than later, but I killed two as late as October 4 in 1900, when out shooting rabbits.’”—W. A. Nicholson (Hon. Sec. Norfolk Nat. Soc.), St Helen’s Square, Norwich.

Note.—Mr Bird’s letter is valuable from three points of view: first, it records the small red viper in Norfolk; second, the number of eggs found in the females is unusually large; and thirdly, it indicates a somewhat late date of commencing hibernation in that locality, though it must be remembered that the autumn of 1900 was very warm.—Author.

¹ See the ‘Field,’ 15th and 22nd June 1901.

Cambridgeshire.

I have been unable to get much information regarding the Ophidia in this county; but my friend Dr W. S. Syme, of Gamlingay, says it is for a very good reason—viz., that the reptiles are not there. He tells me that both adders and ring snakes are quite unknown in that part of Cambridgeshire, though both species are found in the eastern or Fen district. In the neighbourhood of Gamlingay he has not heard of any one seeing either species during the last twenty years.—Author.

“I once saw a ring snake at Wicken Fen which was quite 36 if not 40 inches in length, the longest I have ever observed.”—Frank Bouskell, F.E.S., F.R.H.S., Market Bosworth.

“The ring snake is the most common in this county, sometimes growing to a length of 4 feet. The adder is very rarely seen.”—Albert H. Waters, B.A. (Hon. Sec. Pract. Nat. Hist. Soc.)

Bedfordshire.

“The adder is the most common, and this species is rare and local, a few being taken from time to time on Rowney Warren, near Shefford, and occasionally elsewhere. Snakes are too rare in the county to give an estimate of their average lengths, and I have but one or two records of the ring snake being taken at all.

The smooth snake does not occur, as far as I know."—J. Steele Elliott, Hillcrest, Clent, Worcestershire.

Huntingdonshire.

The ring snake is the common snake of this county, but I have been unable to obtain any reliable figures as to its average length.

Captain J. A. Vipan tells me that the adder used to occur in Homle Fen, but he has not seen one there for a great many years, neither has he observed this species in any other locality in the county. There is no record of *Coronella austriaca* having occurred.—Author.

Northamptonshire.

"The ring snake is the most common snake in the county, averaging 35 inches in length. Adders are scarce, but used to be common at Brampton Wood, near Desborough. The keeper there tells me that he often killed them there when he first went to the wood, which at that time had been allowed to grow wild for some years; but for the last six years he has not seen one. I got a large ring snake from Milton Park, Peterborough, on June 30, 1898, measuring 45 inches, the largest I have seen. It was dropped by a heron, which was flying over some trees near their nesting-place. In this park ring snakes are very common."—Charles East Wright, Woodside, Kettering.

NORTH NORTHAMPTON.—“ Between thirty and forty years ago the adder was very plentiful in a large wood in North Northamptonshire, near here, and is still found there, but in very reduced numbers. The ring snake is not common.”—J. A. Vipan, Stibbington Hall, Wansford.

CHAPTER XXIV.

V. SEVERN PROVINCE.

- | | |
|----------------------|-----------------|
| 33. EAST GLOUCESTER. | 37. WORCESTER. |
| 34. WEST GLOUCESTER. | 38. WARWICK. |
| 35. MONMOUTH. | 39. STAFFORD. |
| 36. HEREFORD. | 40. SHROPSHIRE. |

Gloucestershire.

"For more than twenty years I was a constant observer of the reptiles of this county, and have had from 70 to 80 ring snakes in captivity and about a dozen adders. The ring snake is the more common of the two, and averages from 2 feet to 2 feet 6 inches, though the old ones attain a greater length. The largest I have seen, which was killed by a boy near Stroud, measured 3 feet 10 inches when dead. I have had them both in and out of the egg, and reared one for its first year on tadpoles and young newts. I have had other ring snakes from the same locality measuring 3 feet 8 inches, 3 feet 7 inches, and 3 feet 6 inches, the two latter of which I captured on the same day. One of these threw up the *fur and bones*

of an adult meadow-vole. I have often been bitten by them, but have sustained no harm from their bites.

“The adder averages 21 inehes in the males, 23 inehes in the females. The biggest I ever had was a giant $26\frac{1}{2}$ inehes long, measured alive. I turned it out where I found it.”—Charles A. Witehell, Chorlton Kings (author of ‘Fauna of Gloucestershire’).

On January 17, 1888, Mr C. A. Witchell read a paper on the “Reptilia and Batrachia of Gloucestershire,” from whieh, by his permission, the following extracts are taken:—

“I have no record of the smooth snake having been seen wild in this county.

“The ringed snake varies in its ground colour in all shades between warm red-brown and clear light-green, and these different shades correspond with the length of time elapsed since the last shedding of the skin, for the brown snake becomes a green snake when this event takes place.

“About midsummer the female snake lays her eggs, from 4 to 27 in number, in—if possible—her favourite nest, a manure-heap. I have never been able to hatch out snakes’ eggs in a cage.

“In confinement the snake likes to catch his own dinner, and will seize newts swimming in a vessel of water in his cage. One of my snakes ate 17 newts at a meal; another devoured a gudgeon 6 inehes long; and a third, when eoiled round my hand, would catch

sticklebacks in an aquarium. He lowered his head in the water and opened his mouth, when the fish mistook his red jaws for a piece of meat, or perhaps a worm, and coming near were captured. This snake was a small one, but had no difficulty in disposing of a stickleback, whether the spines of the fish (which are a quarter of an inch long) were erect or depressed. The snake is said to eat toads, and undoubtedly does so, but not, I believe, habitually. I have had but one which would touch a toad. This snake was very hungry and ate a little toad. About four days afterwards the snake died ; and as there was a bright-green mark on his stomach, I cut him open, and there was the toad undigested, but a nauseous mess, dark green in colour ; and all the tissues of the snake at this part, from the intestines to the skin, were discoloured.

“ The skin of this snake is generally cast entire, and always exceeds the length of the reptile from which it has been removed. I have always found the skins of snakes which were captured in the fields to be more brightly polished than those of snakes captured among stones.

“ The female does not incubate her eggs, but still she appears to have some sort of feeling of protection towards them ; for after any of my snakes had laid eggs they were always singularly fierce and intractable, hissing violently when the litter in the cage was disturbed, and one of them struck at my hand when the eggs were removed.

"The viper or adder is fairly plentiful on the Cotteswolds. It is generally about 2 feet in length. The ground colour varies in all shades between slaty-white and warm red-brown. The viper is often found in close proximity to the common snake. The food of the viper consists principally of mice, but Dr Henry Bird informs me that he has often found in the stomachs of vipers dissected by him the remains of the common black dew-snail (*Arion*). The viper may be found a little later in the year than the ring snake, and appears to be able to withstand a somewhat greater degree of cold. The smell of the viper is peculiar, and I often discover them in spring by smelling them at a distance of some yards. Dr Bird informs me that the light-coloured vipers are males and that the brown ones are females. I have always found light-coloured vipers near or in stone walls, and brown ones upon dead leaves or the litter of woodland undergrowth. The viper refuses food in confinement, but all of mine drank water every day, though they would not touch a mouse.

"With regard to the strength of the viper's poison, I may mention the experience of Professor Rupert Jones, who told me that he saw a very little viper, about 6 inches long, crossing a road, and presented his finger to it, which the reptile at once struck, inflicting a painful wound. Mr Jones's hand swelled, and the bite was, he said, as painful as the sting of a wasp."—C. A. Witchell (as above).

BRISTOL and DISTRICT (part Gloucester, part Somerset).—"The ring snake is the commoner in damp places, the adder in dry spots; on the whole, the ring snake is more numerous. I have measured an adder 24 inches, but the average is under that figure, the ring snake growing to a length of 36 inches, but the majority are smaller. I once found three good-sized frogs and one toad in a ring snake, the unfortunate amphibians having been swallowed hind-leg first."—H. J. Charbonnier, 15 Cranbrook Road, Redland, Bristol.

"The ring snake is the most common snake in this county, the average length being about 2 feet, but I have often taken them up to 30 inches. The largest I ever got was $36\frac{1}{2}$ inches.

"The adder also occurs, the average length being about 13 or 14 inches, though I have found them as large as 24 inches.

"I have never seen the smooth snake."—Ed. L. T. Austen, Wolford Fields, Shipton-on-Stour.

Monmouthshire.

In a county which shows the most diverse conditions of cultivation and barren hills, populous and lonely spots, it is only to be expected that animal distribution will show great local variety, and so it does. Both adders and ring snakes are fairly common in their respective habitats, but, taken over the whole county, the ring snake is the more

numerous. In some places near Abergavenny it is extremely common, and often grows to $3\frac{1}{2}$ or 4 feet.

In the extreme north of the county, from Monmouth Cap to where the Monnow joins the Wye, the adder is the common serpent—in some parts, indeed, the only species; and here the average length is unusually great, as was stated in the detailed account of this area in chap. xiv.

The small red viper occurs in the northern part, but not the smooth snake.—Author.

Herefordshire.

I have many times heard the remark made by Hereford farmers, "There are no snakes [*i.e.*, ring snakes] in Herefordshire, only adders." This, though not absolutely true for the whole county, is true for many parts of it. It applies particularly to that part of Herefordshire which lies to the south of the Wye, where in some places adders are common and ring snakes almost unheard of. The same thing applies to a part of the county near the Worcestershire boundary—at Bishopsfrome. The average size of male adult adders in the county is 24 inches, females $25\frac{1}{2}$ inches, these measurements being based on a large series of adders I have measured during the last five years (1895 to 1900). As showing how adders escape observation unless carefully looked for, I may mention that a very good observer of birds in the county was extremely surprised to hear that

I had captured some adders in a wood close to his house, as he had never seen any there, although he had lived there many years. The belief that the adder-mother swallows her young is prevalent

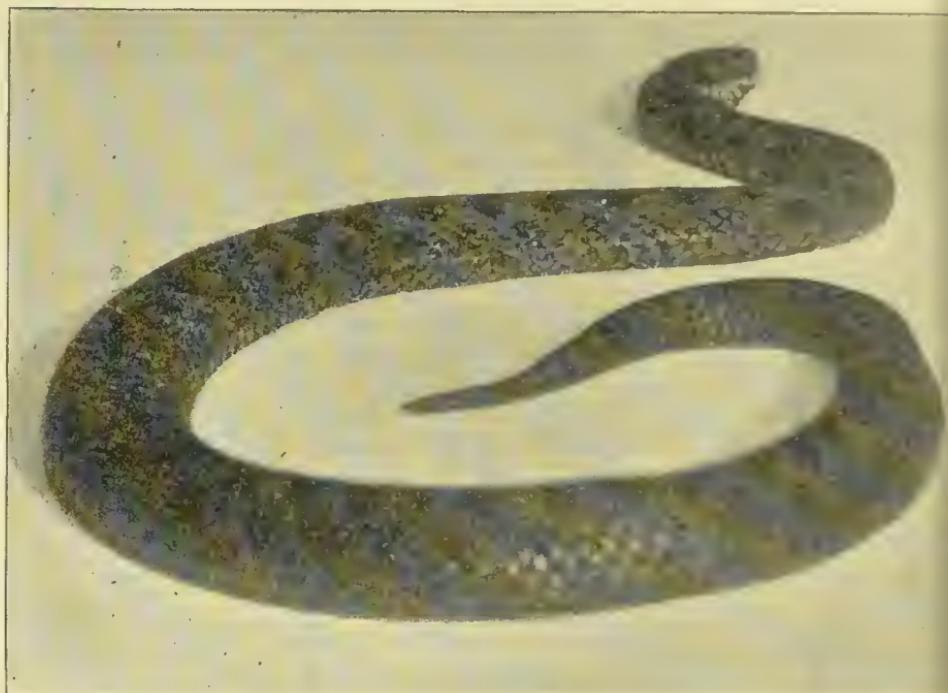


FIG. 47.—MALE ADDER (24 inches), Ewyas Harold,
HEREFORDSHIRE.

throughout the county, and I must have had the incident described to me by quite fifty people who say they witnessed it. But I am still waiting for the specimen with *the young in the gullet*.

But the ring snake does occur in Hereford, more especially in some of the large woods in the middle

portion of the county, where very large ones—over 4 feet—are sometimes killed. It is also found,



FIG. 48.—FEMALE ADDER (26½ inches), HEREFORDSHIRE.

more numerous in some summers than in others, in the neighbourhood of Ross. On Welsh Newton

Common, approachings Symonds Yat, both adders and ring snakes are found.

I have seen the small red viper twice on Garway Hill in Herefordshire, but never *Coronella austriaca*.

The late head-keeper on the Stoke Edith Park estate tells me that in that part of the county the ring snake is more abundant than the adder, and averages from $2\frac{1}{2}$ to 3 feet. He once had a curious experience here, which he relates thus: "About six years ago, in the month of April, I was going my round, when I saw a very large ball of something rolling down a rough piece of stony ground in the wood. On getting near it I shot at it, and, to my surprise, found that it was a bunch of snakes. I killed and wounded about thirty, and a large number got away." These snakes had evidently been hibernating *en masse* when the keeper came across the bunch.

See also various notes in 'Transactions of the Woolhope Field Naturalists' Club' (1898 to 1900).
—Author.

WHITCHURCH DISTRICT.—"In the district of Whitchurch, near Ross, the green snake (*Tropidonotus natrix*) is the most common, and though not nearly so common as formerly, is still often met with. At one time this species used to be found in numbers together, especially when large manure-heaps were turned over. Most of the adders I have seen have

been in the woods, and averaged about 18 inches long, though I have seen larger ones. They were nearly always in old 'coal-plains,' or places where charcoal had been made, and invariably on high ground. I have had dogs bitten by adders in October when shooting, but never knew an adder attack anything unless trodden on or startled. I surprised one once lying curled up on a 'ride' at Credenhill Park, and this one struck at me. I killed the adder—a very long one. The reptile had apparently just killed a shrew as I came upon it."

—John P. Brown, Hampton Park, Hereford.

"I have never seen *Tropidonotus natrix* in the county, but it occurs at Whitchurch, Fownhope, Stoke Edith, Cradley, and other places. One caught at Clapham some years ago, which measured $5\frac{1}{2}$ feet (Mr J. J. Walker, R.N., of Sheerness, being my authority), is the largest I ever heard of. About thirty years ago adders used to swarm in what was then a young larch plantation on the Croft side of Bircher Common."—Extract from a paper on British Snakes, Woolhope Club Transactions, 1898-99, by Mr T. Hutchinson, Hon. Sec.

Worcestershire.

"The ring snake is commonly distributed all over the county, and has an average length of about 3 feet. The adder is more local in its occurrence, being very common in Wyre Forest, where I fre-

quently see it, at Ankerdine Hill, at Knightwick, and at Old Storridge, near Leigh Sinton, and probably in many other localities which I cannot speak of from actual experience.

"The ring snake averages about 3 feet. I have seen adders varying from 18 to 26 inches long, but I should say the average length would be from 22 to 24 inches. The smooth snake I have never heard of in Worcestershire."—Wm. H. Edwards, Curator, "Hastings" Museum, Worcester.

Warwickshire.

"The ring snake is the most common here, the average length being from 30 to 32 inches. In certain localities this species seems fairly plentiful. One of these places is Beoly, twelve miles from Birmingham, where I took several this summer (1900), and one last summer which measured 39 inches. I have never been fortunate enough to take a specimen of the adder myself in this county, but I am told it is fairly common in Sutton Park, a few miles from Birmingham. The only measurement I can find recorded of an adder is that of one taken in the spring of 1884 in this park, which was 23 inches in length. There is no record of the smooth snake occurring.

"I have at the present time a large specimen of the ring snake which laid sixteen eggs last August. The first three of these were laid separately, and at intervals of two or three days each, whilst the other thirteen

were laid at one time, but separate from one another.”
—B. J. Horton, Sparkbrook, Birmingham.

WOLVERHAMPTON DISTRICT.—“The common ring snake is the only species which occurs in this district, and these I have seen in plantations, their length being from 18 inches to 2 feet. These snakes become common at Coalbrookdale, in Shropshire, some eighteen miles from here.”—Wm. Hutchinson, F.G.S., Wolverhampton.

Staffordshire.

“The ring snake is found generally in the county, especially in the dry uncultivated woodland districts. In some parts of the north of the county, especially in the valley of the river Churnet, is this snake common, one might almost say abundant, and may be seen any sunny day in early summer and until the end of September if the season is a warm one. In winter the snakes are said to congregate in some numbers amongst stones and in walls near the large lime-kilns at Froghall, attracted by the warmth of the large kiln-fires.

“The adder is found in the uncultivated mosses and marshy grounds of Cannock Chase and Chartley Park, Whitmore, and Wybunbury, but is not common, and is becoming rarer as drainage takes place. It is a useful animal to the farmer, destroying large numbers of mice and voles. After cast-

ing its slough the ground colour of the body is creamy-white, and with the black diagonal markings is then an extremely handsome reptile.

"Adders are not uncommonly found in the Burnt Woods near Eccleshill, the largest being about 2 feet in length. A friend of mine took 15 young from a female adder a year or two ago."—John R. B. Masefield, Rosehill, Cheadle, Staffordshire.

"The ring snake is most common in hedgerows and on cultivated or meadow land; the adder is confined to heaths, as at Chartley Park and Cannock Chase. Both species have become rarer of late years; but the adder is still not uncommon on Cannock Chase, though getting rare at Chartley, where it once abounded. The decrease of its numbers here is specially marked since the park was drained. The ring snake varies from 2 to 3 feet in the county, the adder averaging, as far as I can judge, from 20 to 22 inches."—G. H. Storer, F.Z.S., Cardigan Villa, Blackpool Street, Burton-on-Trent.

Shropshire.

"*Ring Snake*.—This is the most abundant of the reptiles in Shropshire, and is found pretty generally throughout the county. It is also the largest British reptile, occasionally reaching a length of 5 feet: such a size is, however, quite exceptional, and it is more often found measuring between 30 and 36 inches.

"*Adder*.—In Shropshire the adder is not nearly so numerous as the ring snake. It is entirely absent from the immediate neighbourhood of Shrewsbury, the nearest places where it occurs being Nesscliff and Pim Hills. It is fairly numerous in the neighbourhood of Oswestry and Ellesmere, on Rudge Heath and Whixall Moss in the north, and on Titterstone Clee Hill and in the Forest of Wyre in the south. The adder varies a good deal in its ground colour, but is generally either of a dull brownish-grey or a coppery-red hue. According to Rev. J. T. Lee, who dissected a large number of specimens found near his residence, Far Forest Vicarage, in the Wyre Forest, the difference coincides with the sex, the grey ones being males and the coppery ones females."—'Fauna of Shropshire,' by H. E. Forrest, pp. 194, 200.

Worcestershire and Shropshire.

"I have frequently taken the adder in the Wyre Forest. The largest specimen I took there was 26 inches long, and contained two mice or voles—one full-grown, the other immature and partially digested.

"The ring snake I believe to be absent altogether from the Forest proper. This species was, however, frequently taken a few years ago close to Dudley, and no doubt still occurs there. The exact locality was between Dudley and Lower Gornal, in Staffordshire.

"In certain parts of Cannock Chase the adder is still fairly abundant, and I have known several taken in an afternoon. On April 22, 1894, five adders were brought to me from that locality, three males and two females, the latter 25 and 26 inches long respectively. The female of 25 inches contained fifteen eggs. On April 28, in the same year, I myself found several adders there.

"On August 18, 1895, a ring snake was shown to me which had been killed at Shatterford, in Worcestershire, by a keeper. This is the only one that had been seen in that place." — J. Steele Elliott, Clent, Worcestershire.

OSWESTRY DISTRICT.—"The adder is the most common in this locality, having an average length of 1 foot. The ring snake is rarely seen." — Geo. Lees, Woodhill, Oswestry.

CHAPTER XXV.

VI. SOUTH WALES PROVINCE.

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| 41. GLAMORGAN. | 43. RADNOR. | 45. PEMBROKE. |
| 42. BRECON. | 44. CAERMARTHEN. | 46. CARDIGAN. |

Glamorganshire (East).

"I have seen more adders in one hour's walk in the island of Arran than I have seen during a twenty-seven years' residence in and regular walking in South Glamorgan—in fact, I have only killed three in all that time. I consider them very rare here. They are only seen on the hilly districts, there averaging from 19 to 21 inehes long. The ring snake, on the other hand, is common everywhere in the district, averaging from 32 to 41 inehes in length, being found wherever there is a dunghill and some standing water, especially in the Vale of Glamorgan. (The slow-worm—*Anguis fragilis*—is always ealled an adder here, and is fairly common. Before the Government took possession of the island of Steep Holm in the Bristol Channel, there was a very handsome circum-

coloured variety to be found there, while on the Flat Holm there was only the ordinary chocolate-coloured one, like that found in the county elsewhere.)"¹—John Storrie (Assoc. Linn. Soc.), 104 Frederick Street, Cardiff.

Glamorganshire.

"I was born on a farm about half a mile to the south of the town of Llantrisant (Newpark), a place which was infested with snakes and vipers. From my experience of these reptiles, extending over thirty years, I have found that they exist in a greater number on the limestone or ironstone measures immediately adjoining the coal-beds on the South Crop, and I believe it is so on the North Crop, near Aberdare, Vaynor, &c., in North Glamorgan, and the borders of Breconshire.

"It would seem to me that the snakes, &c., still retain the locality of the submerged forests, where they probably existed in a large state in prehistoric times. The plants of this particular neighbourhood differ somewhat from the plants actually growing above the coal-beds—and which plants may be conducive to animal life—upon which the snake (the

¹ The above report was sent to me for this work shortly before Mr Storrie's death. This sad event will be fresh in the minds of all Glamorganshire naturalists. By his death the county has lost its best local naturalist, and a man of wide learning in kindred sciences. He was the author of a Fauna of Eastern Glamorgan, and an Associate of the Linnaean Society.—Author.

viper or adder especially) exists. The common viper appears to me to have a peculiar liking for the soil of the ironstone measures, the common ring snake being more widely dispersed over coal-beds adjoining.

"A specimen of the common English snake killed at an old disused lead-mine at Gwernefa, near Llantrisant, measured 5 feet 10 inches, and was the largest English snake I have ever seen.

"I mention this particular one to show that the ring snake does not travel far from its place of birth —the snake had been seen for several years near the same place previous to its being killed. The date was the 10th of March 1885, the weather being fine and bright, with occasional heavy snow-showers. On the same morning two companions and myself killed over eighty common snakes and adders, including three of the small red viper, or, as it is locally known, the blood adder.

"I have seen eight adders killed on the 8th of February in different parts of the bank in one particular field, but no ring snakes were seen on that morning.

"This would tend to show that the viper feeds earlier in the season than the ring snake. The former must also feed very rapidly after being aroused from a torpid state, for I have seen them in the month of May very plump and fat, and having every appearance of being well fed, whereas when first seen early in the season they appear very lean and whip-like.

Again, with regard to the adder, I have followed the young vipers, and have more than once seen them disappear when 5 or 6 inches long down the throat of the parent adder. When the young are in danger the parent sets up a loud hissing, which attracts the young, who seek refuge in the manner before stated. I speak from actual experience. I know the point is much discussed by naturalists, but I have seen the mother adder killed with the young alive in her pouch or throat to the number of four.

"1. The most common snake would appear to be the ring snake.

"2. The average length of the adder would be 1 foot 8 inches.

"3. The red viper occurs, but is very rare. I have seen some twenty or thirty specimens from Bridgend on the east to Pentyrch on the west of the county.

"4. I have known two instances of snake-bite, neither of which was fatal. The viper's bite is very poisonous. One of the injured was a child, aged eight or nine years, bitten on the heel whilst bathing. The other was an adult, bitten on the hand whilst fenceing. Both were ill for several weeks, but the bite did not appear to have any particular after-effects; and I believe that, unless a person's constitution were in a very bad or weak state, the bite of the English adder or viper is seldom fatal.

"I have seen several small terriers and sheep-dogs bitten by adders, but have never known a dog to die

from the effect of the bite. The dog, after being bitten, gets very shaky for a time, and likes to mope by himself in an out-of-the-way place until he gets better, in a week or nine days." — T. Rees, Llantrisant.

"The marshy spots around Llantrisant are famous for snakes. I do not think that the coal, limestone, or ironstone measures or the localities of submerged forests have anything at all to do with snakes and vipers.

"Snakes like wet ground and adders like a dry soil. The smooth snake has not been found in Glamorgan.

"The food of the common or ring snake consists mainly of frogs, and snakes are found most numerous in wet meadows and marshes or in the neighbourhood of water, where they can easily get a supply of their favourite food. They take to the water readily, and I have frequently seen them swimming in the dykes on the Grangetown Moors, where they used to exist in considerable numbers. They dive well, and can stay under water for ten minutes or more, and catch and devour water-newts, of which they are very fond.

"Two snakes of this species, which I kept in confinement for about three years, were exhibited, amongst others, in my vivarium at the Cardiff Exhibition of 1881. They measured after death 4 feet 0½ inch and 4 feet 2 inches respectively. The longest I caught when sunning herself on a manure-

heap near the Llanishen Viaduct, and the other in a similar position not far from the Tan Yard on Penarth Road. They were both females.

"Our snakes and adders, in common with others, change their skins at more or less frequent intervals, but not, as is often stated, at regular periods, or once a-year, but sometimes as often as four or five times a-year, according to circumstances. In this 'sloughing' process the skin begins to peel around the edges of the mouth, the old skin is thrust back over the head, and the snake crawls out, leaving its old coat turned inside out. I have frequently seen these 'sloughs' collected and worn by men in the harvest-fields inside their hats as a specific against headache. The colours and markings are very bright and distinct after a change of skin.

"Adders appear to me to differ in colour somewhat, according to the soil upon which they are found. Many of those caught at Leckwith on the Lias limestone are very light-coloured, especially after a recent 'sloughing,' and I have noticed a distinct reddish tinge to the adders which live about the old iron-mines at Little Garth.

"I have kept a considerable number of snakes and adders alive in my vivarium during the past twenty years. Ring snakes are interesting, and rather tractable in confinement, but vipers are utterly untamable.

"As to the adder swallowing its young when danger threatens them, we must still consider this as 'not

proven.' Adders are ovo-viviparous—that is, the eggs are retained in the oviduct and hatched there, the young, to the number of from 10 to 15, making their advent alive, and as spiteful and vicious as their parent.

"The fact of an adder being killed and live young found inside does not prove that she swallowed them.

"I have several times had my dogs bitten by adders in Monmouthshire, but in no instance did the bite prove fatal, although the animals were very ill for some time afterwards. In one case, where a Gordon setter was bitten on the nose by a very large viper, I thought the poor dog would have died on the spot. He had to be carried home, and after being dosed with ammonia, eventually recovered."—T. W. Proger (author of chapter on Local Reptilia in the Guide-Book for British Association in Cardiff).

Brecon.

"The ring snake is by far the most common snake here, and its average length is exceptional, being probably *four and a half feet*. I have seen one specimen which was 5 feet 9 inches in length.

"I have seen only one adder in ten years, but the average length is about 21 inches."—W. W. Baldock Fry, M.B., Builth, Breconshire.

Note.—The ring snake has a larger average length in Brecon than anywhere I know of in this country,

and the specimen alluded to above by Dr Baldock Fry is the largest that I have any record of—except that of Mr Rees, which was 5 feet 10 inches.—Author.



FIG. 49.—MALE AND FEMALE ADDERS, CENARTH, SOUTH WALES.

NEWCASTLE EMLYN DISTRICT.—“The Newcastle Emlyn district comprises considerable portions of Caermarthen, Cardigan, and Pembrokeshire. I should say that the adder has plenty of oppor-

tunities of attaining its majority. Ring snakes are certainly seen in larger parties. I have never seen more than one adder at a time, but some time ago my brother and myself were lifting an ancestral tombstone which had fallen. Underneath there were ten ring snakes, the longest about 1 foot in length.

"The adder averages 18 to 24 inches in this locality."—Frank Davies, Newcastle Emlyn.

Radnorshire, Caermarthen, Pembroke, and Cardigan.

"I have been in Radnorshire for eighteen years, but have never heard of or seen any snakes, though the slow-worm is plentiful. From personal knowledge of the three other counties above mentioned, I can say that the adder is plentiful in all of them. Several times I have seen the result of their bites on dogs—considerable swelling for 5 inches or so round the spot bitten—but I have never known of death resulting. I once saw a wren's nest full of young dead birds and an adder hanging from the nest. In these latter three counties, also, the ring snake is fairly common, of a grey-blue colour, and generally about 3 feet long."—Rev. J. Herbert, Disserteth Rectory, Llandrindod, Radnorshire.

Cardiganshire.

"The adder is the common snake in this county. Its average length is about 18 inches. This species

is specially venomous where it occurs upon the peat-bogs, where I was bitten by one in May 1892.

"I have never met with the ring snake in the district, though it must doubtless occur, as it does in Merionethshire. I have seen a specimen from Towyn."—Prof. J. H. Salter, D.Sc., University College, Aberystwith.

ABERYSTWITH.—"Both the adder and the ring snake are common all over this county, and there are some of the latter species in my garden. I have the greatest difficulty in preventing my gardeners from killing them, as I cannot get them to believe in the harmless nature of this snake. Neither do they appreciate the good these snakes do in devouring the small black slugs with which we are overrun about here."

"On the Borth Bog there are any amount of adders, and they are darker in colour than the Scotch adder. Many years ago, on the edge of the bog, my gamekeeper came across a ball of them, which he shot at, killing six. At the same place, near Glandovey, I once killed an adder in the kitchen. It was not safe to take any dogs on the bog in the summer."—George W. Cossens, Bronpadarn, nr. Aberystwith.

CHAPTER XXVI.

VII. NORTH WALES PROVINCE.

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| 47. MONTGOMERY. | 49. CARNARVON. | 51. FLINT. |
| 48. MERIONETH. | 50. DENBIGH. | 52. ANGLESEY. |

North Wales.

"In Montgomery the adder is rare, and in my experience only occurs in that corner of the county near Oswestry, on Golfa Hill; near Welshpool; and on the Breidden Hills. It is said to occur on Long Mountain.

"The ring snake, on the other hand, is generally distributed, specimens of 2 feet 9 inches, 2 feet 5 inches, 2 feet 10 inches, and 3 feet 6 inches being recorded.

"In Merioneth I have never seen the adder at all, and doubt its occurrence. The ring snake is common in the Towyn district, and fairly so in the neighbourhood of Corwen, in both localities attaining the usual length of 30 inches."—H. E. Forrest (author of 'Fauna of Shropshire').

Montgomery.

Writing to me from Llanidloes, Dr Thomas Morris says: "This town is the highest in Wales, and is therefore very cold. It is situated about ten miles from the foot of Plinlimin Mountain. I have resided here for fifteen years and am always riding about the country, but during all this time I have never seen either a ring snake or an adder, nor have I heard of others seeing any. I conclude, therefore, that there are very few, if any, serpents in this immediate neighbourhood." This is of interest, as a little farther north, at Carno, in this county, Mr H. E. Forrest tells me that a ring snake measuring 3 feet 2 inches was killed in 1900.—Author.

Merionethshire.

"In this county the ring snake is the most common, averaging from 30 to 36 inches in length. The adder averages from 12 to 13 inches."—D. Arthur Hughes, M.R.C.S., Barmouth, North Wales.

"The common ring snake is the only species I have seen in this part of the county (Corwen). This is common between Corwen and Bala, its length being usually about 2 feet. I have also seen this species at Llangollen, in Denbighshire. I am told that the adder occurs at Barmouth, but personally I have never seen a specimen in Wales."—Thos. Ruddy, The Gardens, Pale, Corwen.

Carnarvon and Anglesey.

"I have seen adders in both these counties a good many times, and though I once saw a grass snake (*Tropidonotus natrix*) at Barmouth, I do not think this species is common in North Wales. I have never heard of the smooth snake in Wales at all."

—Chas. Oldham, Knutsford.

Denbigh.

"Both adders and ring snakes are fairly common here, the latter predominating. I should estimate the average length of the adder at 2 feet, that of the ring snake 4 feet." — W. B. Russell, M.B., Colwyn Bay, Denbigh.

"Both adders and ring snakes occur here, and both species grow to considerable size. A ring snake in my garden I estimated at about 5 feet. I have heard of one 72 inches, which was killed in a cluster of ring snakes—17 altogether—on a warm day in March." — W. B. Halded, Brynderwen, nr. Llanrwst.

Denbigh and Flint.

"On the border of these two counties, between Mold and Ruthin, where I have resided for forty years, the adder is fairly numerous. Our geological formation is Upper Silurian mountain limestone and outcrops of coal-measures. The adder is chiefly found on the

limestone. Some years ago I captured one in a lady's sunshade, coaxed it into a box, and sent it up to the Zoo in London, where it lived about three years. They average from 18 inches to a much greater length. The common ring snake is here almost unknown. Where I used to shoot, south of Abergele, the party used to kill three or four adders per day frequently."—B. G. Davies-Cooke.

Flintshire.

"In this county, on the mosses bordering upon Shropshire, the adder is exceedingly numerous, and, I am told, grows to a large size. Personally I have never seen any over 2 feet there. The ring snake occurs in the same district in fair numbers and grows large."—H. E. Forrest, Shrewsbury.

Anglesey (district round Aberffraw).

"Mr E. Gosling states, in some notes of his in my possession, that he has seen a few specimens of the ring snake in this locality, and that the adder is pretty common. The keeper at Maelog Lake Hotel was bitten by an adder as he was putting his hand into a hole in a stone wall: he nearly lost his life in consequence, and was unable to do anything for nearly a year."—H. E. Forrest, Shrewsbury.

Wales (various districts).

"The adder is particularly abundant along the sandhills north of Barmouth, but out west the ring snake is comparatively rare. On the 'mosses' in the southern portion of Flintshire the adder is very numerous, and I saw many there this last summer (1900). One which I measured was 21 inches in length."—H. E. Forrest, Shrewsbury.

CHAPTER XXVII.

VIII. TRENT PROVINCE.

- | | |
|--------------------|-----------------------------|
| 53. SOUTH LINCOLN. | 55. LEICESTER WITH RUTLAND. |
| 54. NORTH LINCOLN. | 56. NOTTINGHAM. |
| | 57. DERBY. |

Lincolnshire.

" In this county both the adder and the ring snake are found, but in different kinds of places. The ring snake is the more common on the damp heaths and peaty ground, while the adder frequents the high dry heaths and woodlands. I have measured very few adders, but the ring snake averages from 2 feet 6 inches to 3 feet 3 inches. My grandfather, Edward Shaw Peacock, of Bottesford Moors, who died in 1861, was an accurate man, and a good naturalist for his day. He left some MS. notes, from which the following extracts are taken. The words in brackets are mine.

" ' When Thos. L[ockwood] first began to warp Nathanland [a well-known stretch of the common,

which still bears this name, though it is all arable fields], he took in or embanked about [blank] acres across the north end of the 114 belonging to my fa[ther] and Mr Hall. There was a sandhill on it on which grew great furze or whins. It was a great place for snakes, as they were safe there [when the other part of the common was flooded, and a great deal of it was under water most of the winter before the enclosure]. When the first tide was taken in T[honias] L[ockwood] had several men walking on the top of the banks to be ready to stop it if any water came through [the recently made embankments]. When the water from the Trent had got amongst the furze on the hill, the snakes left it and swam to the bank where the men were, who killed them as soon as they got out of the water. Old Thomas Stocks, who was one of the men, told me more than 50 [were killed in this way], and he was always a very punctual [*i.e.*, accurate] man.' [The viper and common grass snake are still found on the commons close by. I have heard old men speak of 'the wonderful sight' to see 'a flooding' before warping became common. The fox, hare, rabbit, stoat, and weasel, as well as the marsh and sand-common birds, all attempted to escape to the banks at once, and became an easy prey to the watchers with guns and sticks.]

"The higher cultivation of Lincolnshire is fast destroying our snakes. Year by year there is less and

less ground left for them to inhabit. *Zootica vivipara* can continue long after the ring snake and the adder have gone. In the Trent Level the adder is found on the sandhills and the ring snake on the intermediate peaty soils, or rather this was the case until our commons became very restricted in area. Scores of intelligent and truthful labouring men have told me incidents of the adder swallowing the young. In one case the number of young mentioned was eleven. I have no experience on the point, and therefore no opinion. I greatly doubt having seen an adder of 18 inches long in the county."—Rev. Ed. Adrian Woodruffe-Peacock, F.L.S., F.G.S., Vicar of Cadney, Brigg.

"The ring snake turns up now and again in all parts of the county, but I have seen it plentifully, especially on Scotton Common and Blyton Carrs. A friend living near these localities writes to me, 'One sunny morning in early spring the ring snakes were lying on a hedge-bank in scores—the place was alive with them.' The average length of this snake here is about 3 feet or slightly over.

"The adder occurs not unusually on Scotton Common, and the same writer says, 'I should consider it plentiful; and on one of my rambles I brought one home and placed it in a box with a sheet of glass over it for observation. Next day I was much surprised to find four young ones with it. Somehow or other one of them made its escape. On the following spring I was moving some stones near the greenhouse flue, and

there he was, reared up and hissing like an old one.' The average length of the adder for the district may be said to be 21 inches.

"I do not know of the smooth snake having occurred in the county."—Arthur Smith (Hon. Sec. Grimsby Nat. Soc.), 5 Cavendish Street, Grimsby.

"The grass (or green snake, as it is called here) is the common snake of this county, and I have seen three lying together on a sunny bank. On April 30, 1899, eleven of these snakes and one adder were killed by a keeper and some young men in Bracken Wood, at Woodhall Spa, about five miles from here. Useless slaughter!! A ring snake measuring 3 feet 8 inches was recently killed at this same place. I have kept this snake tame, and its only defence when disturbed was inhaling air till it was puffed out and then emitting the air charged with a foul smell. Its favourite place in cold weather was under the fire-grate; but when a hot coal fell on it the reptile would rush out hissing. I have seen one killed which contained 32 eggs. This specimen was over 3 feet long, but the average length is about 2 feet in this locality.

"The adder is much less common, but is found on a heath near. The average local length is 16 or 18 inches. I had a dog bitten by one when out shooting, but recovery took place.

"*The colour variation.*—The adder varies in colour, adapting itself to its locality. On our sandy moor it is a light-red or almost golden colour, with the line of

black marks along the spine and the V-mark on the head of a yellow colour. I have seen the adder on the South Downs near Brighton, and should say that the adders there are identieal with our Lineolnshire vipers. I think I have never seen one over 18 inches in length. In Sutherlandshire, on the grey limestone roeks, the adder is of a greenish-slate colour, with a blaek line on the back and a large black V on the head. In these northern adders the head is nearly an ineh broad, and the body as far as the rump much larger than in Lineolnshire adders, the tail being small. Lying on a rock these adders have a very fiendish appearance.

“Note.—The flounder is a parallel case of colour variation in fish, in deep or shallow water, the fish being dark or light respectively on its upper side.”—Rev. J. Conway Dalter, Langton Rectory, Horncastle, Lineolnshire.

Leicestershire.

“As an old rambler about this eounty, and especi-ally about Charnwood Forest, I should say that the adder was more common than the ring snake here. I speak of the years between 1840 and 1870; but it is quite possible that the relative frequency of the two species is now the reverse, as is stated in Montagu Browne’s ‘Vertebrates of Leicestershire’ (1889). I have always had a firm belief that in very early days

I saw a female adder swallow her young in my father's garden, at the edge of a shrubbery, but my memory of the occurrence is too confused now to be of use as evidence. But I know that at least thirty years ago I fully believed that I had seen the thing done."—F. T. Mott, Birstal Hill, Leicester.

"In this county the ring snake is the most common, and averages 30 inches in length.

"The adder here is very rare, and those I have seen have been small, about 14 inches long."—Frank Bouskell, F.E.S., F.R.H.S., Market Bosworth.

"The ring snake, the most common ophidian in this county, has here an average length of from 27 to 30 inches. The adder grows to 18 inches."—Montagu Browne, F.G.S., F.Z.S., Corporation Museum, Leicester.

Rutland.

"The ring snake is the most common in this county, and averages about 2 feet in length, I should say. Adders are not common near here, nor do they grow to any large size."—Reginald Haines, M.A., Uppingham, Rutland.

Nottingham (Retford District) and Lincoln.

"I have no secure evidence that the adder is found in the Retford district at all.

"The ring snake is not at all common, and many of the younger generation do not appear to have seen

them. The older people have seen this species occasionally.

"In this part of Lincoln I have records of the ring snake from Littleboro', in this village (South Leverton), and in Treswell Wood."—Rev. Alfred Thornley, Vicarage, South Leverton.

Derbyshire.

"In the Bakewell district the adder is more often seen than the ring snake, the average of the former being about 22 inches, that of the latter about 30 inches. The smooth snake does not occur, to my knowledge. In the summer of 1898, on a Field Club day, we came across a very fine adder which on examination appeared to be quite blind, the result of some kind of fungus growth over the eyes."¹—Wm. Boulsover, Bakewell, Derbyshire.

¹ This was probably a case of canker.—Author.

CHAPTER XXVIII.

IX. MERSEY PROVINCE.

58. CHESHIRE.

60. WEST (*i.e.*, MID) LAN-

59. SOUTH LANCASHIRE.

CASHIRE.

Cheshire.

"The ring snake is the most common, averaging 3 feet in adult state, but has been taken up to 4 feet.

"The adder is fairly common, the adult averaging 18 inches.

"The smooth snake does not occur, to my knowledge.

"I have kept all three of our snakes in captivity. I have bred ring snakes, and witnessed the copulation of these animals. The male becomes very active for about half an hour before copulation, cutting all sorts of fantastic capers, the female remaining quite passive. A female I had in captivity always laid her eggs in the same spot in the cage, that spot being the warmest, where she and the eggs got the morning, noon, and afternoon sun. She always incubated her

eggs in confinement, like the python in the Zoo, instead of leaving them to the warmth of nature, as ring snakes do in a state of nature. Why the change of habit? Was she aware of her changed conditions, and hence took to protecting her eggs? She laid eggs to the number of 16 at a time.

"I have seen a large female ring snake swallow four adult frogs at one meal; and have often made the snake disgorge frogs by stroking the snake's neck, the frogs being none the worse for having been temporarily swallowed.

"I have kept a viper under water for twenty-five minutes—a long time for a reptile to be under water.

"A ring snake of mine swallowed a common toad and then ejected it, and would never again touch toads. I saw a young ring snake swallow a slow-worm almost its own size, but I arrived in time to release the slow-worm, the latter none the worse."—Lin. Greening, Warrington.

"The ring snake or grass snake is the more common in this county, and full-grown adults attain a length of about 33 inches.

"I have only met with a single specimen of the adder during fifteen years or more. I have never seen the small red variety of adder, though I have seen quite marked varieties. Last year I saw a very interesting variety from Bull Bay, Anglesey, where this species is common."—R. Newstead, Grosvenor Museum, Chester.

Lancashire and Cheshire.

"The ring snake occurs occasionally about Whittingham, near Preston, but is not so frequent as formerly. I have not seen one over 22 inches long. Its local name is 'lang worm' (long worm). It also occurs on Hale Moss, near Bowdon.

"The adder is common on Chat Moss; near Patricroft (where I have frequently seen them basking at the foot of the railway banks); not infrequent on the peaty heath-covered tops of the Fells; Bleasdale Forest; Parlic Pike; Fairsnape, &c. The average length of those I have seen in North Lancashire would be about 13 inches. Since the introduction of mowing-machines the ring snake and the slow-worm have much decreased in numbers, and I have many times seen them—especially the latter—snipped to pieces in the machine."—R. Standen, Manchester Museum, Owens College, Manchester.

Note.—A farmer in Monmouthshire told me that he had cut up three adders in this way in mowing one field of hay this summer (1900).—Author.

CHAPTER XXIX.

X. HUMBER PROVINCE.

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|----------------------|----------------------|
| 61. SOUTH-EAST YORK. | 63. SOUTH-WEST YORK. |
| 62. NORTH-EAST YORK. | 64. MID-WEST YORK. |
| | 65. NORTH-WEST YORK. |

Yorkshire.

SCARBOROUGH DISTRICT. “*Adders*. — These are common wherever the locality is suitable for them, but they are gradually dying out from continuous persecution. The general length of the males is 18 or 19 inches, that of the females 20 to 22 inches. The largest female that I have measured was $25\frac{1}{2}$ inches. Varieties are very scarce. I have seen hundreds, but not until this last summer (1900) have I seen any variation from the usual type. I caught (and afterwards set at liberty again) a male adder about 18 inches in length, of a bright brick-red ground colour, with very black markings of the ordinary pattern. It was on moorland. In those I have dissected I have never found any other

food than short-tailed field-voles, but I have known (only once) an adder take a viviparous lizard while in captivity. The local name is ag-worm, or perhaps it should be spelt agg-worm.

“*Ring Snake*.—This does not occur anywhere in the Scarborough district. I have two brought me at different times, but they were both undoubtedly escapes.

“*Smooth Snake*.—I am not aware of its occurrence locally.”—W. J. Clarke (Recorder to Scar. Field Nat. Soc.)

North Yorkshire and South Durham.

“The ring snake is the most common here, averaging about 16 inches long, but one was taken near Darlington in 1895 measuring 21 inches. This snake frequents the lower lands. The adder, which is invariably found on the moors and fells, averages about 22 inches.”—George Best, Bondgate, Darlington (Hon. Sec. Darlington and Teesdale Nat. Field Club).

YORK DISTRICT.—“In my experience the adder is most common in this district (York). I have seen it frequently on Strensall Common, varying in length from 15 to 27 inches. The ring snake is not so often met with, but I have seen them about 3 feet in length.”—Robert Dutton, Phoenix House, York.

RIPON DISTRICT.—“I have often met with adders on the moors in this district when out collecting insects, and have never seen a ring snake but once. The adder averages 24 inches and grows to 26 inches in length.”—C. Chapman, The Museum, Ripon.

Yorkshire.

“The adder is the most common in the moorland districts, the grass snake in the low-lying and wooded portions of the county. The male adder averages 18 to 19 inches, the female about 23 inches. The largest female I have seen was 28 inches. The grass snake averages from 3 to 4 feet, but I have seen one 4 feet 6 inches long. The smooth snake has never occurred in the county, to my knowledge.

“It is not generally known that during the day-time grass snakes at times will coil themselves round the stems of the great reed (*Arundo Phragmites*) and other ditch-growing plants a foot or two above the surface of the ground or water as the case may be. A keeper in the Holderness district tells me that he has frequently seen them in this position. I have so often been told by men of known probity and good sense that they have seen the young adders disappear down the throat of the mother that I am inclined to think there is really something in it.”—Oxley Graham, Pickering, Yorkshire.

WAKEFIELD DISTRICT.—“ Around Wakefield the adder is the most common snake, and is found averaging from 22 to 24 inches. Last year (1899) this species was fairly common at Brock-o’-dale, Wentbridge, some ten miles from Wakefield, and adders were also seen at Newmillersdam, four miles from Wakefield. A friend showed me the other day specimens of adders he had taken at Strensil Common in June 1881, May 1882, May 1894 ($23\frac{1}{2}$ inches), and June 1898, and also a ring snake $37\frac{1}{2}$ inches. The adult ring snake reaches 3 feet in the district.

“ Mr Hewitt, who captured these specimens, says adders were very common in the year 1880, but that of late years they have been seen more rarely.”
—George Parkin, 15 York Street, Wakefield.

HALIFAX DISTRICT.—“ In this locality (as I am informed by Mr E. Halliday) the ring snake is fairly common, though he has never seen the adder here. A ring snake captured at Norland Clough in the summer of 1899 measured 30 inches, which is about the usual length.”—George Parkin, 15 York Street, Wakefield.

CHAPTER XXX.

XI. TYNE PROVINCE.

66. DURHAM. 67. NORTHUMBERLAND, SOUTH.
68. CHEVIOTLAND, OR NORTHUMBERLAND, NORTH.

Northumberland and Durham.

"The adder is the most common snake here, and when full grown averages over 2 feet in length.

"Examples of the red viper and the black viper occur rarely.

"I do not know of the occurrence of the ring snake in Northumberland, but I have seen a preserved specimen found near Sunderland, in the county of Durham. It was found in such an unlikely locality that I have thought it must have been introduced. and I do not look on this specimen as proving the species to be indigenous in Durham. Although it has been recorded in the 'Yorkshire Naturalist' as occurring in South Durham, I feel very doubtful about it. If it occurs at all, the most likely place

is in the south-eastern part of the county. I have seen a cluster of the eggs of the ring snake sent here from Northallerton in Yorkshire, and at the present time (1900), from the evidence I have, I do not think that this species occurs north of the Tees. The ring snake and the adder are often confused by people who see them, and I have never during fifty years heard of any of the old genuine observers mention the ring snake as being found in Northumberland. It has often been brought north by pedestrians, and often escapes, but no one ever saw a colony of them in the north, and I have not heard of even one in Northumberland. The adder is our reptile, and is distributed generally over the moorland districts, in the burns, and by the banks of rivers, but never in numbers. One may travel over miles of moorland a whole summer and not see one, although they may be there; and sometimes sheep are bitten, also pointer and setter dogs, the bite generally being on the legs.

"My opinion is that the ring snake does not occur here except accidentally, and that the adder is generally but not abundantly distributed in these counties."¹—Richard Howse, M.A., Museum Nat. Hist. Soc., Newcastle-on-Tyne.

¹ Since sending me the above report—indeed shortly before his death, which I regret to say took place in March 1901—Mr Howse informed me that the black adder also occurred in this district more often than he at first supposed. (Compare with Rev. C. Davies's report on Caermarthen, p. 248.)

Northumberland and District.

"The ring snake is by no means so plentiful in Northumberland as the common viper, but is occasionally to be met with in different parts of the county. It is perhaps more plentiful in the upper reaches of Wooler water than in any other part of the district, at least such is my experience. In the deep, rocky, weird-looking ravine on the eastern slopes of the Cheviots, known as the Glitters, I have seldom failed to find individuals of this species, stretched upon the ledges of precipitous rocks, clinging to the branches of overhanging shrubs, or crawling through the herbage on the steep and heathy bank-sides, where formerly the raven and the peregrine falcon used to build their nests, but where they now no longer find a refuge and a home. Sometimes the ring snake makes his appearance close to the village of Wooler, and some time ago a large individual was killed in Middleton plantation whilst engaged in twisting itself round a branch of a tree. We have met with examples of it at Chillingham, Crookham, and some other half-dozen places in the county. On one occasion I saw one killed near to Warkworth Hermitage, a little below Warkworth Mills, on the river Coquet. It is, perhaps, more plentiful in Durham than in Northumberland, especially in the western part of the county, and is frequently met with on the Wear; and three or four years ago one

was captured in a house in Sunderland, having taken up its residence in a hole in the wall. It is not uncommon in various parts of Berwickshire and Roxburghshire, especially on the sylvan bank of the Teviot and the beautiful Jed and other tributaries of the Tweed.

"The adder is common in many parts of Northumberland and Durham, and the writer has met with it on different parts of Middleton and Belford estates, as well as at Bewick, Hedgesley, and Wooler. When a lad I first became acquainted with this animal 'in the flesh' in the summer of 1849 on Belford Moor, where it was then very plentiful, and where several examples, including a female and nine young ones, were killed during the course of the summer. None of these much exceeded 2 feet in length, but one killed by myself in the coal wood, Belford, on Easter Monday, 1850, measured over $2\frac{1}{2}$ feet, and was the largest specimen I ever saw."—"J. A.," in the 'Newcastle Weekly Chronicle,' 1881.

Durham.

"The adder is the most common serpent in this county. The species is common over the whole of the Derwent valley, from Gibside to Blanchland, the greater part of which district I have explored, and where I have seen many fine specimens. About five years ago I captured one on May 20, measuring not less than two feet. This was very early in the

season for an adder to be astir, and, curiously enough, there had been a snowstorm on the previous night. The average length of adders in this area I should put at 18 inches.

"I have never met with the ring snake in the district, nor do I believe that the species is so common as some state."—W. Johnson, Burnopfield, Newcastle-on-Tyne.

"The common ring or dunghill snake (as it is sometimes called) is much more common than the adder, with which it is often confounded, and is found on dry and moist heaths and moors. It averages from 24 to 30 inches.

"The adder or viper (called edder or ether in Durham) is rare, and found chiefly on stony ground, especially on the western moors of the county, in Teesdale, Weardale, and Derwentdale, averaging in length from 20 to 24 inches.

"The smooth snake does not occur, to my knowledge."—J. W. Fawcett, Slatley, Darlington.

CHAPTER XXXI.

XII. LAKES PROVINCE.

- | | |
|--|-------------------------------------|
| 69. WESTMORELAND WITH
NORTH LANCASHIRE. | 70. CUMBERLAND.
71. ISLE OF MAN. |
|--|-------------------------------------|

The Lake District, or Cumberland, Westmoreland, and Lancashire north of the Sands.

Ring Snake.—“In the extreme south-west of Lakeland the grass snake is not uncommon. Mr W. Duckworth assures me that he can find specimens any sunny morning in the neighbourhood of Ulverstone, and he has sent me ova of this snake from the district. Among the mountains this species becomes comparatively rare, but Mr Tom Duckworth met with single specimens at Stanley Gill, Eskdale, and at Holmrook, near Gosforth. In the Eden valley, as in the north of Cumberland, this snake is extremely local, if not rare. Mr Tom Duckworth has met with specimens in the Newby Cross woods, in which he also found eggs of *Tropidonotus natrix*.

On single occasions he has seen specimens at Newlands, near Carleton, and Black Moss Pool, near Cotehill.

Viper.—“The mosses in the neighbourhood of Morecambe Bay share with those which fringe the Solway Firth the unenviable distinction of affording tolerably safe asylum to large numbers of vipers. I have rarely visited any of our flows on a hot summer's day without coming across one or two individuals of the present species basking in the sunshine upon some heather-covered prominence. The late Mr Kirkby captured great numbers of vipers in the neighbourhood of Ulverstone, and showed me some pretty sections of their teeth under the microscope. His skill in capturing these animals was very great. The occupation appeared to have become his ruling passion.”—Rev. H. A. Macpherson, extract from ‘Fauna of Lakeland.’

“The only local reptile which seems to show a tendency in the direction of variation is the common viper. Most of the Lakeland vipers are grey or brown in ground colour, regardless of their sex. The only instance at present known to me of the capture of a red individual within our limits relates to a viper which Joseph Boadle presented to the Whitehaven Museum. Instead of being grey and black, it is a dull ferruginous red, and the zig-zag markings are a dark mahogany colour. This animal has been caught near Rig House, Dean, West

Cumberland."—Rev. H. A. Macpherson, M.A., 'Fauna of Lakeland,' p. lxxviii.

North of England.

"The viper is pretty common in Westmoreland, Cumberland, and those parts of Lancashire included in the Lake District. This is especially the case in the low-lying lands in the neighbourhood of Morecambe Bay and the Solway Firth. The largest living adder I have sent to me for inspection measured $28\frac{1}{2}$ inches, and was found in the locality of Staveley in the summer of 1890. I have records of adders measuring $29\frac{1}{4}$, $29\frac{1}{2}$, and 31 inches. The average in Lakeland I should put at about 17 inches.

"The ring snake is rather rare in Westmoreland, but fairly common in suitable places in Cumberland and in the Furness district."—G. W. Murdoch, Milnthorpe, Westmoreland.

Lake District.

"One Sunday in August 1897 Mr Clarke, who has charge of the wood above Chapel Hill, Langdale, told me he had just killed a snake which he had seen once before in the spring, but on that occasion it eluded him. Although he had looked many times in the interval for it, he had never seen it again till this day on which he killed it. I walked up to his cottage in the wood, and there he had an adder 19 inches long. Mr Clarke had been in charge of this

wood for nine years, but this was the only snake he had ever seen. For many years I have gone to the Lake District two or three times a-year on geology and botany bent, and I have never seen either the adder or the ring snake, so I conclude both are scarce."—W. Haydon, Liverpool.

Cumberland.

"The adder is the most common snake in this county, being found in all parts, but especially plentifully near the coast-line. Its average length is 18 inches.

"The ring snake is very rare in Cumberland, being quite unknown in the middle of the county. One or two have been seen in the north-west, and twice I have had eggs sent to me from Caldew Valley. In the very south of the county it is more common, but when one crosses the Duddon and gets into the Furness (Lancashire) district it becomes very usual indeed to find it, especially on the low-lying land in the neighbourhood of Morecambe Bay. Its average length in Cumberland may be put at 28 inches.

"The smooth snake is not known here."—W. Duckworth, Beacon Side, Penrith.

North Lancashire.

"The adder is our most common snake here, averaging from 24 inches to 30 inches, and I have seen one

just 3 feet long. I have lived in the district of Ulverston since 1875, and have heard many wonderful yarns as to vipers, or hag-worms as they are called locally. In my own experience I have seen about a dozen, all of which I have killed except the first I saw, which was lying curled up with the head in the middle. I came across him on a foot-road through a wood, where he was enjoying a snooze, probably after a meal. I happened to have a bit of dead wood in my hand, and, in my anxiety to kill the 'beastie,' aimed a blow at once instead of choosing a more reliable weapon. The wood was so rotten that it snapped in my hand and only the end fell harmlessly on the head of the adder, who hissed angrily and made off. They are most often seen in the early warm spring days near old walls and places in which they have been hibernating. I once saw the effect of a bite on a sheep-dog, which had been bitten near the nose, which quickly swelled up and looked very painful. As far as I can recollect, the shepherd applied carbolic oil, and in a couple of days the canine patient was well. One informant tells me that he once saw an adder swimming across Windermere Lake with his head just above the water and making a hissing noise.¹ Another friend rode over one on his bicycle as the adder was crossing the main road from Ulverston to Lakeside."—Rev. P. Hartley, M.A., Colton Vicarage, Ulverston.

¹ This was probably a ring snake.

Lancashire.

"The adder is the most common snake in this county, the average length being from 21 to 24 inches. In this district it is specially found on Clougha Pike, Holker Moss, and at Witherslack in the Mosses. Gamekeepers state that they have had several dogs killed through adder-bites on these Mosses."—Arthur Stanley, Lancaster (Hon. Sec. Field Nat. Soc.)

Various Localities.

"The ring snake is the most common snake in Delamere (Cheshire), the adder being seldom met with. I once captured a ring snake 33 inches long in Delamere Forest.

"On the bogland at Witherslack, near Grange-over-Sands, I have often been cautioned by the old men of the district to 'mind the add-worms,' which they said were plentiful.

"The ring snake is still very plentiful near Harlech and Aberdaron, on Cardigan Bay, and near the latter place one day I watched a blackbird pursuing a good-sized blindworm. I captured the blindworm in my butterfly-net and placed it in a large bottle of cyanide of potassium, and carried it in the bottle a mile and a half. On taking it out of the bottle at the village inn the reptile at once showed activity and drove several farmers from the room as effectively as a rattlesnake could have done."—Mr Robinson, 43 St John Street, Longsight, Manchester.

CHAPTER XXXII.

SCOTLAND.

IT is unnecessary in the case of Scotland to consider the various biological provinces in detail, because, as far as British serpents are concerned, there is practically only one species found over the whole of the country, and that is the adder. The ring snake is occasionally reported in the extreme south-east, in Roxburghshire and Berwickshire, but never commonly even here. About 20 inches is a very usual length for the adder everywhere, though large specimens are taken now and then. The ophidian distribution in Scotland is probably a matter of climate more than anything else, and the adder has, among its other characteristics, a greater capacity for standing cold than the ring snake. Its period of hibernation does not seem to be any longer in the northern clime, as it is generally to be seen in Sutherland as soon even as March, which is quite as early as most of the southern counties in England. The black variety of the adder is found in Scotland more frequently

than in other parts of the country, and some are of opinion that the species has a somewhat different build from the English serpent. Comparatively little attention has been paid to this subject, and it offers a good field of investigation to Scottish naturalists.

Regarding the size of adders in Scotland, the following correspondence appeared in the 'Scotsman' in the summer of 1900, and is reproduced here by kind permission of the editor:—

SIZE OF THE ADDER.

GLASGOW, June 20, 1900.

SIR,—A statement was current in the press two weeks ago that an adder had been killed in Ross-shire 35 inches long. I have made inquiry regarding it, and find that the animal in question was not measured, the length being only guessed at. As at this season of the year the adder is often seen in suitable localities, I should like to be allowed to repeat, what I have over and over again said, that no adder has ever been killed in Scotland of the above dimensions, and to challenge any one to produce a specimen of that length. Last year a correspondent made the assertion that they were common in Ross-shire, and frequently found a yard or more in length, but since my former challenge no one has yet been produced. The maximum length is about 28 inches, and any which are killed and found on measurement

to be over 30 inches in length are well worth preservation and recording; but till that is done I must, like the majority of naturalists, remain sceptical of the yard-long specimens so frequently spoken about.

—I am, &c.,

Eoin.

CHAMBERS, 136 GEORGE STREET,
EDINBURGH, *June 21, 1900.*

SIR,—With reference to the challenge thrown out by “Eoin” in this morning’s ‘Scotsman,’ to produce an adder over 28 inches in length, I have to state that in 1867, when driving with my father from Callander to the Port of Menteith, we captured an adder 36 inches in length. We preserved this adder in spirits for many years, but ultimately my father gave the adder to the late Mr Jenner, of Easter Duddingston, and I have no doubt that this adder is still in the possession of his legatees.—I am, &c.,

GEORGE L. BEATTIE.

THE INCH, EDINBURGH, *June 21, 1900.*

SIR,—It may interest your readers to know that yesterday I found an adder sunning itself on a small patch of grassy ground in a moorland district of Argyleshire. I did not measure it, but thought it was from 18 to 20 inches in length. After dispatching it with my stick, I proceeded to dissect it with the view of ascertaining on what it had been feeding, and was surprised to find no less than three young larks almost fledged, evidently the con-

tents of the same nest. Although, as is well known, reptiles take a considerable time to "suck in" and swallow their prey, the birds must have become its victims at the same time, as the three were intact, with no appearance of assimilation or digestion having commenced. What surprises one is the remarkable powers of distension of the mouth and throat which makes it possible for an adder to swallow anything approaching to the size of a lark.

It is now over twenty years since I recorded having witnessed an adder attempting to drag a grouse chick a few days old into a hole. It had seized the chick by the neck, and blood was squirting out at both sides of the reptile's mouth. On another occasion, when approaching a tuft of heather where a grey hen was sitting on her eggs, I found the bird evidently in great distress. On approaching she flew a short distance, when I espied an adder killing a newly hatched chick, while three others lay dead.

Where grouse are numerous on a moor it is easy to see how an entire brood, when very young, may be killed and devoured by an adder. Fortunately reptiles do not require to feed often, or the destruction to young game would be incalculable.

Should any of your readers, in view of "Eoin's" letter, record the measurements of adders, it would be interesting, indeed, if they would also dissect them and mention on what they had been feeding.—I am,
&c.,

TOM SPEEDY.

ARDGAY, June 21, 1900.

SIR,—Those who take an interest in these matters may like to know that serpents, not adders, of from 3 feet upwards are known in the Highlands.

The report I sent you did not say that the 35-inch snake was an adder. Any person of mediocre intelligence or common-sense knows that adders seldom if ever exceed 28 inches. The biggest I ever measured was $27\frac{1}{4}$ inches exactly. The other long snakes I do not know by name, but they exist. The biggest I have heard of was 4 feet 4 inches, killed by a Donald MacLeod, shepherd, Cearbhaig, near Cape Wrath, an account of which was published in a London paper at the time, but not by me. The information I got as to the paragraph which appeared in your columns was given by a gentleman holding a public office, and who is not given to exaggeration. I have since, however, interviewed the slayer of the serpents, and he assures me that in his opinion the 35 inches reported by me was under the mark. He had no tape-line or foot-rule with him at the time, so his only recourse was to measure with his boots, of which the big snake exceeded three lengths. The man stands about 6 feet in height. He tells me he has had letters from Edinburgh, Glasgow, and other places, to all of which he replied, giving full particulars as to the size, colouring, &c., of the snake. Mr Murray's full name, designation, and address were given at the time.—I am, &c.,

YOUR CORRESPONDENT.

53 HANOVER STREET, EDINBURGH, June 22, 1900.

SIR,—Having the adder referred to by Mr George Beattie in to-day's 'Scotsman' in my possession, I shall be glad to show it to any one interested who cares to call at my address here.—I am, &c.

WM. T. WOOD.

JOPPA, June 22, 1900.

SIR,—More than once I have seen discussions as to the size of adders, confining the extreme length to about 26 or 28 inches. Doubtless there are not many larger in the present time, but Mr Beattie's letter in your issue of to-day, stating that he had caught one in 1867 near Callander 36 inches long, confirms my memory of one which, though not measured at the time, so far as I remember, I have always considered was from 33 to 36 inches in length. When a boy in 1849 I was driving from Haddington to Duns across the Lammermoors, and approaching near Longformacus, found sunning itself at the side of the road what looked a large reptile. The groom lashed it well with the butt-end of his whip until it seemed dead. We then got it thrown into the back of the dogcart, fastening the door. Arriving at Duns, we soon found from its movements that the adder was alive, and opened the door cautiously. Several people had collected. It had raised itself until its head and neck were stretched along the top of the machine and its tail part along the bottom.

Its hissing was easily heard; but it was soon out on the hard causeway and despatched quickly. I was young, and glad to get away from it, and don't know what was done with it. It was not likely to be preserved, at any rate. The box part of the dogcart was large and deep, constructed for carrying large parcels.—I am, &c., R. R. PORTEOUS.

GLASGOW, June 27, 1900.

SIR,—There are some discrepancies in "Your Correspondent's" letter. He says the report did not say that the snake originally referred to was an adder. In those reports which I saw it was called an adder, and the "slayer of the serpents," with whom I communicated, distinctly affirms that it was, so that the whole point at issue was the length. As both he and "Your Correspondent" says it was not measured, except by the rough-and-ready one with the "slayer's" boots, we have no accurate evidence as to the reptile's length. The other snakes which "Your Correspondent" says "are known in the Highlands" have yet to be identified, and all the statements which from time to time have appeared have on investigation been found to be untrustworthy. There are only three species of snakes found in the British Isles—the adder or viper (*Vipera berus*), the ringed snake (*Tropidonotus natrix*), and the smooth snake (*Coronella austriaca*). The adder is our only Highland snake, and as the second named, which is

absolutely harmless, is the only one of the three named which grows to 3 feet or more in length, it may have travelled to the North; but true evidence of that fact has yet to be given, and it is a curious circumstance that all the large serpents killed in the North are lost or cannot be produced for identification by competent authorities.

I am glad to hear that the serpent which Mr Beattie referred to is in existence, and as Mr Wood has kindly offered to show it to any one, perhaps those interested may see whether it measures as has been alleged. I will take an early opportunity to do so myself personally.

Mr Porteous's experience is that of many others reported—it was not measured at the time, and he, after fifty years, "considered that it was 35 or 36 inches in length." Here, in this case, although he says it was an adder, the creature was neither measured nor preserved. No; snakes have been seen often in the Highlands of gigantic and grotesque shapes, but I am afraid to suggest the cause!—I am, &c.,

EON.

GLASGOW, July 27, 1900.

SIR,—I am very pleased indeed to see the letter of my venerable friend the Rev. Dr Stewart ("Nether Lochaber") in a recent issue of your paper on the above subject, which to a certain extent confirms some former statements of mine regarding the adder

in the Highlands. I think I am safe in saying that there is no man living better acquainted with the natural history of our Highlands than Dr Stewart, and I would be pleased if he would give expression to his experience and opinion on the dimensions to which the adder grows in Scotland. Reverting to the former correspondence on that subject, I have since then, through the kindness of Mr Wood, the present owner, examined the "36-inch adder" formerly referred to by Mr Beattie, and fear that the latter gentleman's memory has for once been faulty. The reptile is hermetically sealed in a glass jar, and from its appearance I take it to be about 27 inches long. Mr Wood is unwilling to have the jar broken, and no perfectly accurate measurement can therefore be taken in its present situation. It has also been submitted to an expert in bottled objects, who after measurement stated it to be 28 inches long; but on being asked to be as generous as possible in his measurements, said it might be 30 inches, but both of us agreed independently of each other that it could not possibly be 36 inches long. If the owner will allow the jar to be broken and the reptile accurately measured, I am willing to have it suitably remounted for him at my own expense, and if it measures 36 inches, as Mr Beattie alleged, will give a guinea to any Edinburgh or Glasgow charity which he may care to name; but if it does not come up to the above dimensions, then I leave it to him to say

whether he should not come under a similar obligation. I think that is a fair and reasonable challenge, and one which will settle the question so far as this individual specimen is concerned, and I only ask that as a condition I be represented at the post-mortem.

The question put by Mr Farrow as to the adder swallowing its young in times of any approaching danger is too debatable a subject to open up in your columns. All I would like to say on the matter is that I personally do not believe in the statement, and experiments and investigations on that subject have hitherto been negative, although the opinion is common in many parts of the country.

It might interest Mr Farrow to know that while the blindworm is common in most parts of the Highlands, it is, or was at one time, particularly so in Ailsa Craig, an isolated rock in our firth about eight miles from the mainland, where it grew to a large size, some being 18 inches long. They had abundant food in the large black slug, which is numerous on the Craig; but the accidental introduction of the rat from a shipwrecked vessel reduced their numbers considerably, and I do not think the slow-worms are now quite so plentiful. They are such useful creatures to the farmer and agriculturist that I am always pained to see them so often killed and mangled in our glens from ignorant prejudice as to their nature. For over thirty years I have kept and bred them in confinement, and always found them gentle, harmless pets.

The young are particularly handsome little things in their first coats of golden yellow with a dark stripe down their backs. To those who might care to keep these pretty little lizards, I may say that they are easily kept in such receptacles as a fern-case or an inverted propagating-glass, with a supply of water for drinking purposes, and they may be fed on worms or slugs. The little white slug so much detested by florists and gardeners is a particularly favourite morsel to them.—I am, &c.,

EINO.

NETHER LOCHABER, *July 31, 1900.*

SIR,—In the ‘Scotsman’ of yesterday your correspondent “Eoin” appeals to me to say my say as to the dimensions to which the adder grows in Scotland, and I hasten to comply, for the subject is in many respects an interesting one.

The usual size of the ophidian in question is from 18 to 22 inches. A 24-inch adder is a very large one, and anything beyond 24 inches is extremely rare. The largest I ever saw—and I have in my day seen hundreds of them—was sent to me many years ago from Iona by the Rev. Mr Ritchie, the present minister of the parish of Creich in the Presbytery of Dornoch. Mr Ritchie was then a divinity student. This Iona adder measured $27\frac{3}{4}$ inches in length, and a larger one, it is my opinion, was never seen in Scotland.

The bottled adder in the possession of Mr Wood

may be 28 inches in length; and if it is, it is well worth preservation as an exceptionally large specimen. Honestly measured, however, I question if it will be found to be quite so large as my Iona specimen. In any case "Eoin's" guinea is perfectly safe. If the owner of the bottled snake agrees to his proposal, I am confident that, far from measuring 36 inches, the specimen in question will not even measure 30 inches; and I shall be surprised to hear that it is of equal length with that sent to me from Iona.

It will be of some interest, perhaps, if I state that although got in Iona, and sent to me from Iona, the adder does not occur in that sacred isle. Adamnan tells us that St Columba banished all noxious animals from Iona, just as St Patrick banished "all the vermin" from Ireland. The way in which Mr Ritchie got the adder which he was so kind as send on to me was this. Walking on a beautifully bright and calm summer evening along the silvery strand that borders the narrow sound that separates Iona from the island of Mull, which abounds in adders, he noticed some creature swimming fast towards the shore. When it landed it rested for a little on the warm white sand, which we may suppose was grateful to it after swimming across the sound. It then wriggled up until it reached the adjoining grass-land—the soil proper of the sacred isle—into which it had not crept more than twice its own length when it suddenly stopped

wriggling and was dead! The good people of Iona were surely not to blame if, discarding the suggestion that the reptile had died from exhaustion after its long swim, they rather attributed its sudden death to St Columba's blessing of their island, which for ever rendered its soil inimical to any poisonous creature that ventured to invade it.—I am, &c.,

ALEXANDER STEWART, LL.D.

An excellent account of the "Reptiles and Batrachians of the Edinburgh District" was read on March 21, 1894, by Mr Wm. Evans, F.R.S.E., before the Royal Physical Society of Edinburgh. The author has sent me this paper with his kind permission to quote it, and accordingly I have made the following extracts from it, and from some further notes he has added since then:—

"*Tropidonotus natrix* (*Ringed Snake*). — Several authors refer to this species as an inhabitant of Scotland, but their statements are for the most part of a very general character; and, so far as I can discover, no instance of the actual capture of a specimen in a wild state is on record." [Then follow quotations from other writers.] "After carefully considering the above evidence, I have come to the conclusion that, although probably at one time a native of the Lowlands of Scotland (including the Lothians), the ringed snake does not now exist there as an indigenous animal. As an escape, or an introduced species, it

may, no doubt, now and again manage to establish itself in a way, but only, I fear, for a comparatively brief period at the best.

"Two examples, which we may be sure were escapes or their direct descendants, have been recently captured within the suburbs of Edinburgh—one on a footpath by a wall near Haymarket in July 1892, and the other in a villa garden at the Grange in September 1893. The first was a variety of the common snake, the second a typical specimen. (Other specimens have since occurred in the city.)

"*The Adder.*—The adder or viper is confined to the outskirts of our district, and even there it is very local, and far from common till we reach the highland country beyond Stirling on the one hand, or proceed well into the Lammermoors on the other. I killed two a number of years ago near Johnscleugh in East Lothian. No doubt the adder still exists in a few localities at the foot of the Pentlands, and also towards the Moorfoot Hills. But its numbers must be very limited, for I have wandered a great deal all over the ground during the last thirty years without seeing a trace of one. I have, however, been able to trace them on both sides of the Pentlands. Mr Thomas Gray, Braidwood, Temple, informs me that in his young days they were not uncommon in certain localities in the southern or moorland portion of Mid-Calder parish. Crosswoodhill Moss was a favourite habitat."

Mr Evans then mentions that he has obtained information of the occurrence of adders at the following places: Harperrig, Middlerig, Harburnhead farm, and "one was killed on the road near Crosswoodhill toll five or six years ago."

"In the Bathgate district I have reason to believe adders were at one time not uncommon, but I have not heard of any recent occurrence there. . . .

"On the south side of the Pentlands we know that the adder inhabited Harlaw Muir in the beginning of the present century. On the adjoining extensive moor of Auchencorth I have been told it still exists. A few miles nearer West Linton it has been noted by Mr T. G. Laidlaw, but very rarely, the only example he has actually seen being a dead one lying on the road near Coalyburn, about twenty years ago. . . .

"In Peeblesshire the viper or adder—we are told in Chambers's History of that county—was then (1864) common. . . .

"One about 24 inches long was killed in Minch-moor in 1892, and a large example in the schoolhouse garden at Tweedsmuir in 1892. In the parish of Temple, in the southern portion of Mid-Lothian, and towards the foot of the Moorfoot Hills, it would appear still to linger in one or two suitable spots. . . .

"Throughout the greater part of the Lammermoors adders are still fairly common. They were unusually

numerous in Lauderdale in 1864 ('Scotsman' and 'Zoologist'). . . . Mr James Caverhill says, 'The country round about Crichness is full of "ether." On a certain rocky face he could undertake to kill a dozen in a suitable day. Taking the country generally, a shepherd might kill twenty to thirty in a season. . . .

"Dr Hardy says in reference to the Border counties, 'At Caldron shepherd's house, at foot of Spartleton, adders are numerous. Occurs in Greywacke Crags. The Dye Water, apparently to near its head as well as its tributaries, full of adders.' . . .

"As regards the north side of the Forth, I have no actual record for Fife, though I have been told that adders used to be seen on a moor in the western part of the county. In the detached portion of Perthshire immediately to the west of Fife Mr J. J. Dalgleish informs me that many were killed in 1869 on a piece of moss of three or four acres which was being levelled. Since then he has not heard of any in that quarter. In the more highland part of the valley beyond Stirling they are still to be met with in many spots, but, except in a few localities, not plentifully. . . . Between Callander and Port-o-Menteith the moors round about Loch Rusky are a favourite habitat, where a few are killed every year. The only example of the reddish-brown variety I have been able to hear of was killed a few years ago in a ploughed field a mile or two from Callander."

The above copious extracts are from Mr Evans's paper, in addition to which he has sent me the following notes:—

"Adders are still common in the neighbourhood of Aberfoyle, S.-W. Perthshire, where I met with quite a number in April and May in 1896. I measured a few as follows: female 20 inches; male $20\frac{1}{8}$ inches; female 22 inches (the two last killed at one blow); female $20\frac{3}{4}$ inches. In May 1898 a specimen said to be 26 inches in length was captured by the members of the Scottish Natural History Society on Auchencorth Moor." — William Evans, F.R.S.E., 38 Morningside Park, Edinburgh.

"The adder occurs more or less in all the western and south-western counties of Scotland, both on the mainland and on the islands. It is, I believe, becoming more numerous in unfrequented places, but on the islands which are pretty well populated it is scarcer, and in some probably quite extinct. I should say the adder is very numerous in Argyllshire and Dumbartonshire and in Arran, common in Stirlingshire, Renfrew, and Ayr, occasional in Bute and Lanarkshire. This species, however, is so exceedingly shy that unless one devoted an entire hot summer to it no reliable knowledge of its numbers and habits could be got, and this nobody has done. The adder frequently swims across straits and creeks in Loch Lomond, going from

island to island, and is thus one of the three wonders of that lake—

‘Waves without wind,
Fish without fins,
And a floating island.’

The ring snake does not exist anywhere in Scotland, to my knowledge, at any rate in the West.”—Alfred Brown, Luss, Dumbartonshire.

Mr Thomas Scott, F.L.S. (Aberdeen), tells me that he has a specimen of an adder $14\frac{3}{4}$ inches long which was killed in an open drain near East Tarbert, and he heard at the time that the species was not uncommon there. He has also heard of adders being killed on the moors behind Greenock. The slow-worm he has taken on Ailsa Craig.

The unusual occurrence of an adder being found active in the month of December is reported to me by Mr J. H. Browne, of Longformacus, Berwickshire, in which parish the reptile was captured by a shepherd. It was in Christmas week 1900, and the adder measured 26 inches. The shepherd’s dog drew his master’s attention to it. Mr Browne tells me that the average size of adders in the Longformacus district is about 22 inches. He adds that the species is found all over the Lammermoor Hills and on the Duns estate. He mentions that they vary in colour from gold to black.
—Author.

Ayrshire and Arran.

"I have never heard of a ring snake in this district. I once killed an adder on Auchentibber Moss, near here, but have not heard of any in recent years. I also killed one in Glen Sannox in Arran, where adders are still common. I did not measure either of these, but they were not large. In a farmhouse where I stayed on the west side of Arran I was told that the woman there had been bitten on the leg by an adder, and that the limb became 'swollen and black.' Her husband also told me that one day when he was taking down a rick of hay he found it 'full of adders' (they call them 'serpents' there). The farmer added that his method of killing them was to put the heel of his boot on the reptile's head, when 'they aye twist their tail roon ma leg.'”—J. Smith, Monkredding, Kilwinning, Ayrshire.

Stirling.

"The adder is fairly common in this county, and averages 20 inches in length. I have not heard of the ring snake being found, nor do I know of the smooth snake being recorded."—David B. Morris, Stirling, N.B.

Perthshire.

"The adder is common in this district: I have seen as many as five in a single day's excursion. This was

in the Sma' Glen. One or two on a day's walking on the moors is quite a usual experience. The largest specimen I have in the museum measures about 2 feet. Neither the ring snake nor the smooth snake occur, to my knowledge. The slow-worm is found occasionally. The adder averages 18 to 20 inches."—Alex. M. Rodger, Curator to Museum, Tay Street, Perth.

Sutherlandshire.

"Adders are common and large in this county. I have more than once seen them basking on a sunny rock, and as I crept by, on a deer-stalk, one has sprung at my face, but fortunately missed me. They are deadly-looking creatures in this locality."—J. Conway Dalter, Langton Rectory, Lincolnshire.

Inverness.

"Our only Scottish snake is the adder or viper, and this species is more common in the northern than the southern counties. Its usual length is from 18 to 22 inches, although considerably larger specimens are sometimes taken. This measurement applies also to Argyll (and is also true of Scotland at large)."—Alex. Stewart, LL.D., F.S.A., Nether Lochaber.

"The adder is common in nearly all suitable places in Scotland, and is particularly so in Mull and Arran. Its average length is from 18 to 20 inches, but in

Mull, Arran, and Ross-shire specimens have been taken as long as 27 and 28 inches."—J. Macknaught Campbell, Kelvingrove Museum, Glasgow.

Mid-Lothian.

"The adder is the most common ophidian in this county, but is not frequently seen—perhaps more often on the Pentland Hills than elsewhere. Its average length in the county is 24 inches. The ring snake does not occur, and the smooth snake is not recorded. I have seen fourteen adders in different parts of Scotland, the smallest measuring 22 inches, the largest 27 inches. The smallest was captured on the Ochil Hills near Dollar, and the largest at Zenga, in the island of Mull."—A. B. Steele, 41 Regent Street, Portobello.

Aberdeenshire.

"The adder is the only snake of this county, and is locally termed the grey adder. It is found in fair abundance, growing to a length of 24 inches."—John Davidson, Marischal College, Aberdeen.

CHAPTER XXXIII.

TABLE OF AVERAGE LENGTHS OF ADDERS AND RING SNAKES IN COUNTIES AND DISTRICTS.

THE following table of the average lengths of the ring snake and adder in the various biological provinces has been prepared from the mass of correspondence in my possession relating to the local distribution of British serpents. The name of the observer in each case is appended:—

TROPIDONOTUS NATRIX, OR RING SNAKE.

I. PENINSULA PROVINCE.

	Inches.	
Cornwall—Delabole	36 to 42	Author.
Devon—Central	about 30	Dr Dale,
Torquay	30	Alex. Somervail.
Kingsbridge	30	Ed. A. Elliot, M.R.C.S.
Dartmoor	30	Rev. Gregory Bateman.
Somerset	36	H. E. Baleh.

II. CHANNEL PROVINCE.

Dorset—Wareham	30	Rev. O. P. Cambridge.
Central	30 to 39	Rev. F. W. Brandreth.

II. CHANNEL PROVINCE—*continued.*

	Inches.	
Generally	30	A. Old.
Central	30 to 40	Author.
Hants	24 to 30	W. Dale, F.S.A., F.G.S.
Portsmouth	36	Chas. Foran.
Sussex—East	24 to 26	L. B. Hall.
South-east	33	Walter Field.
Central	28	Benjamin Lomax.
St Leonards	34	A. Cheshill.
Do.	up to 36	H. G. F. Spurrell.
Do.	30	Jos. Anderson.
Arundel	24	Leslie E. Lewis.

III. THAMES PROVINCE.

Kent—Dover	34	W. Jacob.
Abbey Wood	30	Arthur Poore.
Tunbridge Wells	37	F. Roberts.
Surrey	36	Author.
Essex	up to 39	E. A. Fitch, F.L.S.
Berks	36	Eleanor G. Hayden.
Reading	34	C. N. Allen.
Bucks	30	M. D. Hill.

IV. OUSE PROVINCE.

Suffolk	24 to 30	H. Miller.
Norfolk	30	Author.
Cambridge	up to 48	Albert H. Waters, B.A.
Northampton	35	C. E. Wright.

V. SEVERN PROVINCE.

Gloucester	24 to 30	C. A. Witchell.
Do.	24 to 30	L. T. Austen.
Do. Bristol district	24 to 30	H. Charbonnier.
Monmouth—North	36	Author.
Hereford	24 to 30	Author.
Worcester	36	Wm. H. Edwards.
Warwick	30 to 32	B. J. Horton.
Stafford	30	W. Gregory.
Do.	36	J. R. B. Masefield.
Shropshire	30	H. E. Forcst.
Wolverhampton district	24	Wm. Hutchinson, F.G.S.

VI. SOUTH WALES PROVINCE.

	Inches.	
Newcastle Emlyn district	24 to 30	Frank Davies.
Glamorgan—East	32 to 41	John Storrie, A.L.S.
Brecon	54	Dr Baldock Fry.

VII. NORTH WALES PROVINCE.

Merioneth	30 to 36	D. Arthur Hughes.
(See table by H. E. Forrest.)		

VIII. TRENT PROVINCE.

Lincoln	30 to 39	{ Rev. E. A. Woodruffe-Peacock.
Do.	36	Arthur Smith.
Leicester	27 to 30	Montagu Browne, F.Z.S.
Do.	30	Frank Bouskell, F.E.S.
Rutland	24	Reginald Haines, M.A.
Derby	30	W. Boulsover.

IX. MERSEY PROVINCE.

Cheshire	to 33	R. Newstead.
Do.	to 36	Lin. Greening.

X. HUMBER PROVINCE.

Yorkshire—North	16	G. Best.
York	36	R. Dutton.
Ripon	26	C. Chapman.
Wakefield	36	George Parkin.
Generally	36 to 48	Oxley Grabham.

XI. TYNE PROVINCE.

Durham	24 to 30	J. W. Fawcett.
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XII. LAKES PROVINCE.

Lancashire—Holker Moss	up to 42	Arthur Stanley.
Cumberland	28	W. Duckworth.
Isle of Man	{ ophidians absent }	P. M. C. Kermode.

VIPERA BERUS, OR ADDER.

I. PENINSULA PROVINCE.

	Inches.	
Cornwall—Perranwell	$\left\{ \begin{array}{l} \text{male } 20\frac{1}{2} \\ \text{female } 20\frac{3}{4} \end{array} \right.$	$\left\{ \begin{array}{l} \text{C. Rogers.} \\ \text{} \end{array} \right.$
Devon—Torquay	18	Alex. Somervail.
Central	under 24	Dr Dale.
Kingsbridge	12	Ed. Elliot, M.R.C.S.
Dartmoor	20	Rev. Gregory Bateman.
Generally	$\left\{ \begin{array}{l} \text{male } 24 \\ \text{female to } 27 \end{array} \right.$	$\left\{ \begin{array}{l} \text{H. P. Heardcr.} \\ \text{} \end{array} \right.$
Somerset—Wells	up to 27	H. E. Balch.

II. CHANNEL PROVINCE.

Dorset	up to 24	A. Old.
Weymouth	14 to 18	Nelson Richardson.
Wareham	18 to 24	Rev. O. P. Cambridge.
Central	14 to 24	Rev. F. W. Brandreth.
Do.	$\left\{ \begin{array}{l} \text{male to } 23 \\ \text{female to } 26 \end{array} \right.$	$\left\{ \begin{array}{l} \text{Author.} \\ \text{} \end{array} \right.$
Hants	18 to 20	W. Dalc, F.S.A.
Portsmouth	18 to 20	C. Foran.
Gosport district	21	W. Pearce.
Sussex—St Leonards	20	A. Cheshill.
East	18	L. B. Hall.
Do.	13 to 18	Ben. Lomax.
South-east	21	Walter Field.
Do.	24	Jos. Anderson.
Do.	20 to 24	H. G. F. Spurrell.
Arundel	21	Leslie H. Lewis.

III. THAMES PROVINCE.

Kent—Tunbridge Wells	23	Fred. Roberts.
Dover	22 to 24	W. Jacob.
Surrey	up to 23 $\frac{1}{2}$	Oswald Latter.
Berks—Wellington	up to 24	J. Bevir.
Do.	18 to 24	C. N. Allen.

IV. OUSE PROVINCE.

Inches.

Suffolk	to 24	H. Miller.
Norfolk—N.E.	{ male to 24 { female to 26	} Rev. M. Bird.

V. SEVERN PROVINCE.

Gloucester	{ male 21 { female 23	} C. A. Witchell.
Do.	14	L. T. Austen.
Do. Bristol district	under 24	H. Charbonnier.
Monmouth—North	{ male 24½ { female 25	} Author.
Hereford—South	{ male 24½ { female 25	} Author.
Do. Bishopsfrome	24	Adelaide C. Browne.
Stafford	18 to 24	J. R. B. Masefield.
Do.	20 to 22	G. H. Storer, F.Z.S.
Shropshire	18 to 24	H. E. Forrest.

VI. SOUTH WALES PROVINCE.

Glamorgan—East	19 to 21	John Storrie, A.L.S.
Do.	20	T. Rees.
Brecon	21	W. Baldock Fry, M.B.
Caermarthen
Pembroke—Newcastle	{ 18 to 24	Frank Davies.
{ Emlyn district		
Cardigan	18	Prof. J. H. Salter.

VII. NORTH WALES PROVINCE.

The following table is a summary of information in the possession of Mr H. E. Forrest, collected in the preparation of a book on the fauna of North Wales :—

COUNTY AND DISTRICT.	ADDER.	RING SNAKE.	OBSERVER.
Montgomery	not observed	very numerous	J. Fort.
Llanerfyl	..	plentiful	Rev. C. Harington.
Guilfield	..	plentiful	P. A. Beck.
Llansansffraid	occurs in dry years	rather scarce	G. Dnmville Lees.

VII. NORTH WALES PROVINCE—*continued.*

COUNTY AND DISTRICT.	ADDER.	RING SNAKE.	OBSERVER.
Merioneth— Barmouth	less common	common	J. C. Rawlings.
Rug	not observed	fairly common	Hon. C. B. Wynn.
Towyn	not observed	frequently seen	R. Robinson.
Caruarvon— Bangor	fairly plentiful	fairly plentiful	G. Assheton Smith.
Clynnog	common	..	E. W. Badger.
Llandudno	..	not common	A. Moore.
Denbigh— Colwyn Bay	not common	fairly common	W. B. Russell.
Do.	sparingly distributed	not abundant	R. Newstead.
Llanrwst	plentiful	abundant up to 4½ ft.	B. W. Halhed.
Flint— Mold	fairly common	not observed	B. Davies-Cooke.
Anglesey	abundant in places	generally distributed	R. Newstead.
Aberffraw	fairly common	a few seen	E. Gosling.
Merioneth	12-13 in.	..	D. Arthur Hughes.
Denbigh	18 in.	..	W. B. Halhed.
Do.	to 24 in.	..	W. B. Russell, M.B.

VIII. TRENT PROVINCE.

Inches.

Lincoln	21	Arthur Smith.
Do.	16 to 18	Rev. J. Conway Dalter.
Leicester	14	Frank Bouskell, F.E.S.
Do.	18	Montagu Browne, F.Z.S.
Derby	22	W. Boulsover.

IX. MERSEY PROVINCE.

Cheshire	18	Lin. Greening.
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X. HUMBER PROVINCE.

Yorkshire	{ male 18 to 19 female up to 23 }	Oxley Graham.
York	15 to 27	R. Dutton.
Scarborough	{ male 18 to 19 female 20 to 22 }	W. J. Clarke.
North	22	George Best.
Wakefield	22 to 24	George Parkin
Ripon	24	C. Chapman.

XI. TYNE PROVINCE.

	Inches.	
Durham	20 to 24	J. W. Fawcett.
Durham and Northumberland	} 24	Richard Howse, M.A.
Durham	18	W. Johnson.

XII. LAKES PROVINCE.

Lancashire—North	24	Rev. P. Hartley.
Lancaster	21 to 24	Arthur Stanley.
Cumberland	18	W. Duckworth.

XIII. TO XVIII. PROVINCES OF SCOTLAND.

Scotland—generally	18 to 20	J. M'Knaught Campbell.
Aberdeen	24	J. Davidson.
Inverness	18 to 22	Alex. Stewart, LL.D.
Mid-Lothian	24	A. B. Steele.
Stirling	20	David B. Morris.
Perthshire	18 to 20	Alex. M. Rodger.

In the case of English counties which are not mentioned in the foregoing table, a reference to the local distribution will show that the Ophidia are so few in these counties that it is impossible to get reliable figures. In the remaining parts of Scotland the average is much the same as that stated in the districts mentioned.

APPENDIX.

THE following pages are intended to be filled up by the field naturalist as specimens come under his observation, thus providing a permanent record of the relative frequency and average lengths of the various species in the locality referred to, and a means of comparison with the observations of others.

(The author would be grateful if observers would communicate to him the result of their observations from time to time.)

VIPERA BERUS, OR ADDER.

LOCALITY.	SEX.	LENGTH.	OBSERVER.

VIPERA BERUS, OR ADDER.

TROPIDONOTUS NATRIX, OR RING SNAKE.

TROPIDONOTUS NATRICE, OR RING SNAKE.

CORONELLA AUSTRIACA, OR SMOOTH SNAKE.

LOCALITY.	SEX.	LENGTH.	OBSERVER.

INDEX.

The names of counties, districts, and localities will be found under the heading "County Distribution."

The detailed references to the three species of British snakes will be found under the respective headings "Adder," "Ring Snake," and "Smooth Snake."

q. = quoted or quotation.

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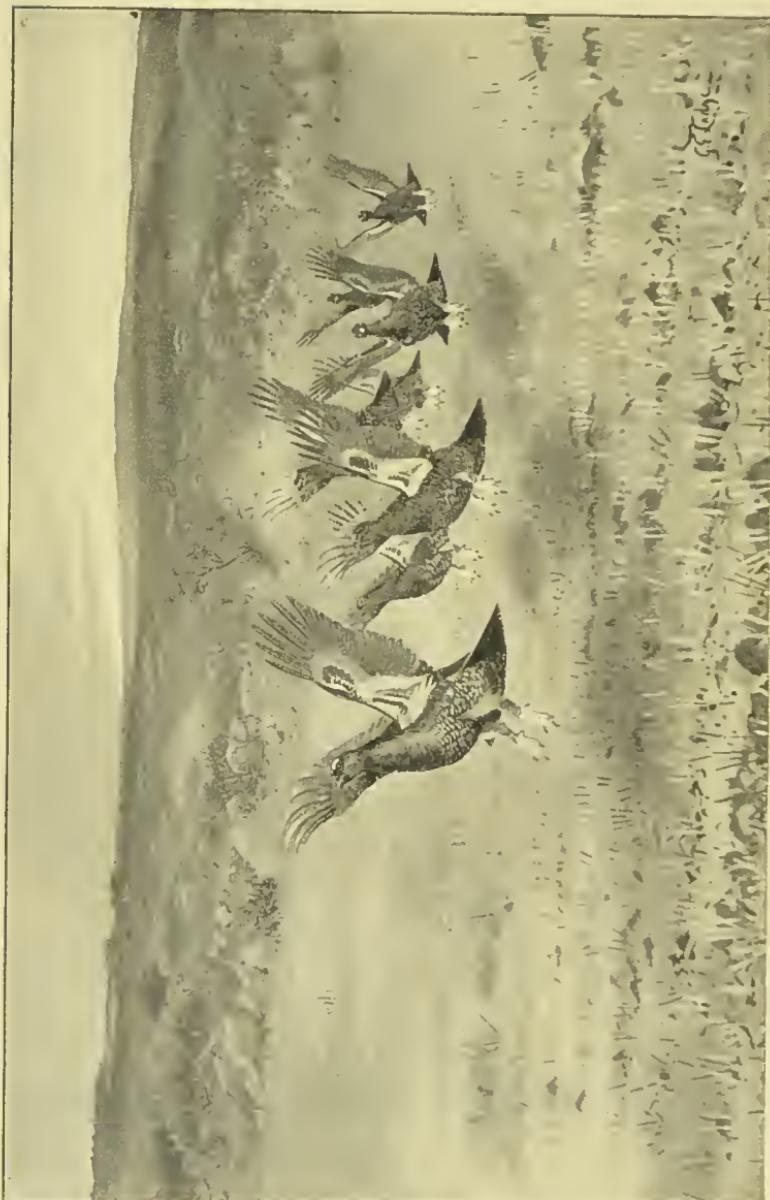
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